COLLEGE ARCHITECTURE IN AMERICA

CHARLES Z. KLAUDER
AND
HERBERT C. WISE

COLLEGE ARCHITECTURE
IN AMERICA

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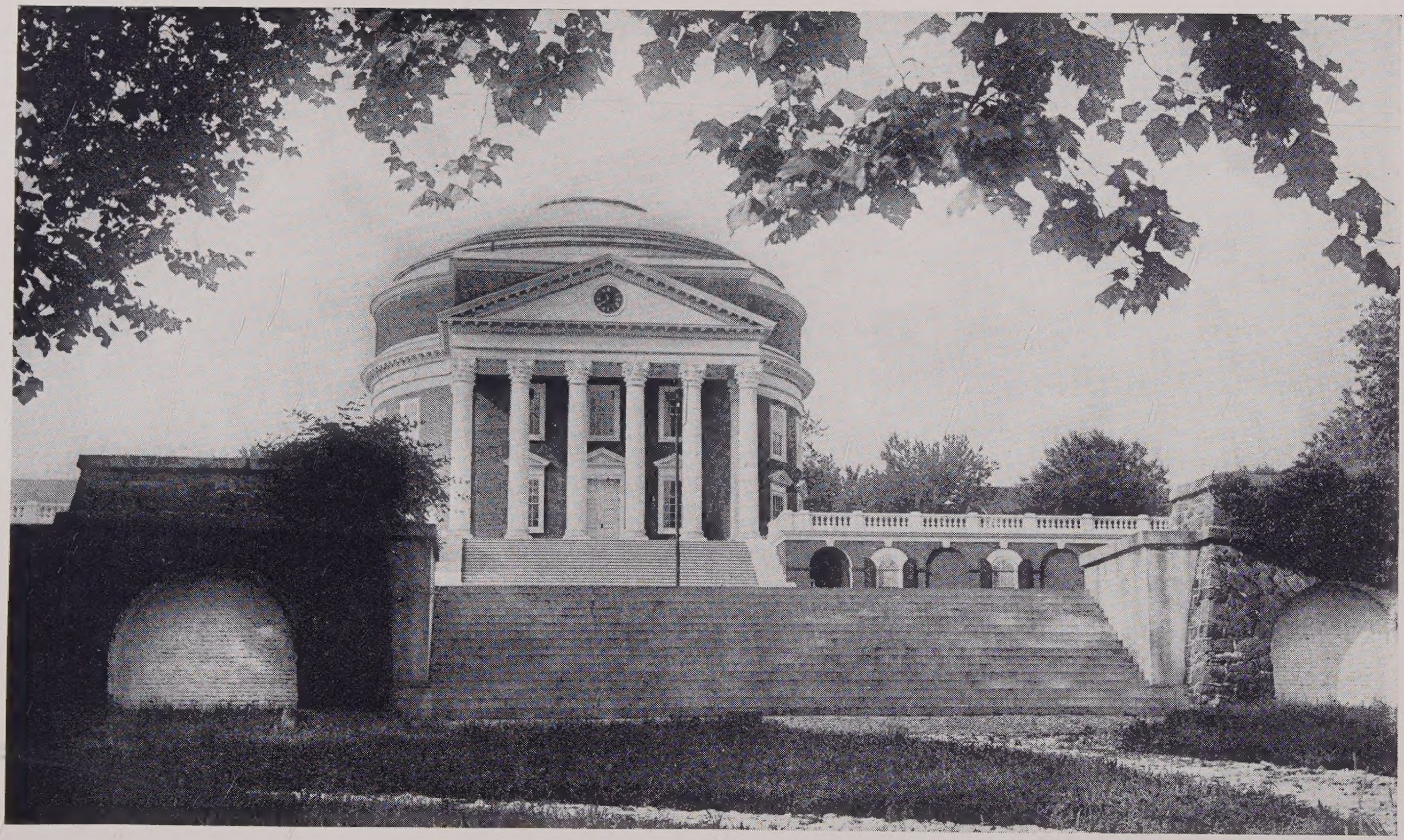

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College Architecture in America

AND ITS PART IN THE
DEVELOPMENT OF THE CAMPUS

BY
CHARLES Z. KLAUDER
AND HERBERT C. WISE

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BY ROBERT L. KELLY
Executive Secretary of the Association of American Colleges

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FOREWORD

THE authors of this book have given in a sentence its sufficient *raison d'être.*

> There is no art in which this country has made more rapid strides than architecture, and our institutions of learning should embody this national progress, especially since it so effectively ministers to all other arts as well as to science and to daily life.

The book registers at its best the present-day theory and practice of college architecture. It calls the colleges back to indigenous architectural standards. It projects a distinctively American college architecture, adapted not only to climatic, environmental, and other physical conditions, but to the rapidly advancing methods of collegiate education. The motive of the book is to sound a call for better architecture at those places where the best of everything is needed—our colleges and universities.

The authors have not spared themselves in the expenditure of time and effort on the production of the book. They have sought and received suggestions from members of their own fraternity and of the Commission on College Architecture and College Instruction in Fine Arts of the Association of American Colleges.

The publication of the book has been made possible because of a subvention from the Carnegie Corporation of New York City.

Acknowledgment to all these unselfish workers is made on behalf of the Association of American Colleges, whose members will profit most from this book in the years to come.

ROBERT L. KELLY.

NEW YORK CITY,
April 1, 1929.

AUTHORS' PREFACE

Upon being requested to write a book on the architectural development of American colleges and intended as a body of suggestion to institutions contemplating physical improvement, the task appeared impossible, by reason of the scant and fragmentary leisure resulting from an exacting professional practice. It was realized, however, that there might be a need for such observations as could be made as a result of some thirty years' experience in designing college and university buildings. Having entered upon the undertaking, the work grew in unexpected volume as it proceeded, and the propriety of double authorship soon became apparent.

The first preliminary was a survey of a large number of educational institutions throughout the country, with a view to supplementing the knowledge already assimilated by having had for years a number of these as clients. Over seventy were personally visited. Where remoteness prevented this, inquiries were mailed and brought forth generous responses. This co-operation from busy college officers is the more appreciated as they are known to be under a perennial burden of questionnaires of many sorts. It was unfortunately upon college catalogues and "view books" alone that we had to rely in some cases. The sincere thanks of the authors are here extended collectively to all those who have co-operated by their hospitality upon visits of inspection, by providing data of many sorts, and critically reading some of the manuscript.

Those highly stationed in the educational profession view a world so large and full of other exigencies that architecture can but occupy a fraction of their thoughts. It seems to us, however, the growing weight of architectural appreciation and judgment cannot be ignored. Expressed in numbers alone what does this amount to? There are thousands of practising architects in the United States and many more thousands of their assistants or draftsmen. Add the students at the architectural schools, and there is obtained an approximate total whose lives are preoccupied with the art of architecture. There are in addition a great number of persons practising and studying other arts, the æsthetic principles of which are so closely akin to those of architecture that the judgment of these specialists upon architectural design is usually intelligent and often of great value. Last, but not least, is that body of our population, abounding in college and university circles, who, through contact with books and exhibitions, with travel, the observation of fine architecture, and with other channels of culture, acquire a knowledge and a standard of taste enabling them to pass intelligent judgment upon the æsthetic quality of buildings. Add all these and the result is a minority of our people, to be sure, but a minority of no mean proportions, and one that is increasing in size and influence. When it is realized that many persons can know an institution only by a passing gaze or by a cursory survey of its externals, the fallacy of placing too low an estimate upon architectural merit is manifest.

This is not a book of plans. There is no building illustrated which is exactly suitable to any other site, purpose, or institution than its own. Trustees and officers of colleges which have building in prospect are recommended to inspect other structures of the type contemplated. It is with this in mind that a brief list of some additional examples worthy of study is given in the index of illustrations and supplementary thereto. These lists are in no sense to be taken as complete, and it is hoped that no injustice is done to excellent buildings which may be omitted only because the authors have not been able to discover them.

It is believed that pertinent ideas, new principles or useful suggestions may be found by the inquiring reader in the illustrations presented, even though the quality of the architecture be not always of the best. In selecting these examples an attempt has been made to cover a wide field embracing diverse conditions. This field we have conceived as expansive, not only geographically but with respect to large urban and rural communities, to large and small institutions, to the different types of institutions and to the long list of able architects who have designed creditable buildings for colleges and universities. Illustrations of buildings subsequent to those of Chapter

One bearing the name of no architect represent the work of Charles Z. Klauder.

The object of these pages is to establish principles, to define standards, to make comparisons, to aid, if possible, in envisaging a completed work of architecture that will win approval as nearly unanimous as may be. Yet there is no solution of an architectural problem that gains all things wished for. Perfection is notoriously elusive. The wisdom of a building committee and its counsellors must, therefore, address itself to the task of naming the desiderata to be preferentially sacrificed. The result of their labors issues from a complex of circumstance, of which the casual observer is as ignorant as he is often copious with his criticism.

If it is observed that the authors are prone to exalt their own art, it is hoped that will be adjudged a pardonable sin. Rather let the reader be assured that another and stronger motive has actuated our work. It will be generally allowed that there are far too many institutions the appearance of which is offensive to the eye and depressing to the mind. Some observers there are who feel the effects without knowing their cause. Beauty we enjoy, it has been said, without our knowing why. Its absence irks us equally mysteriously. Indeed, it seems to us, no heights of scholastic standards can atone for the ugliness of architectural surroundings. No round of culture can be complete if there is indifference to an important art.

It is the fervent hope that these modest pages will prove helpful in so improving the architecture of colleges and universities that it will win the lasting approbation of all cultivated and discerning people.

PHILADELPHIA,
March 15, 1929.

COLLEGE ARCHITECTURE
IN AMERICA

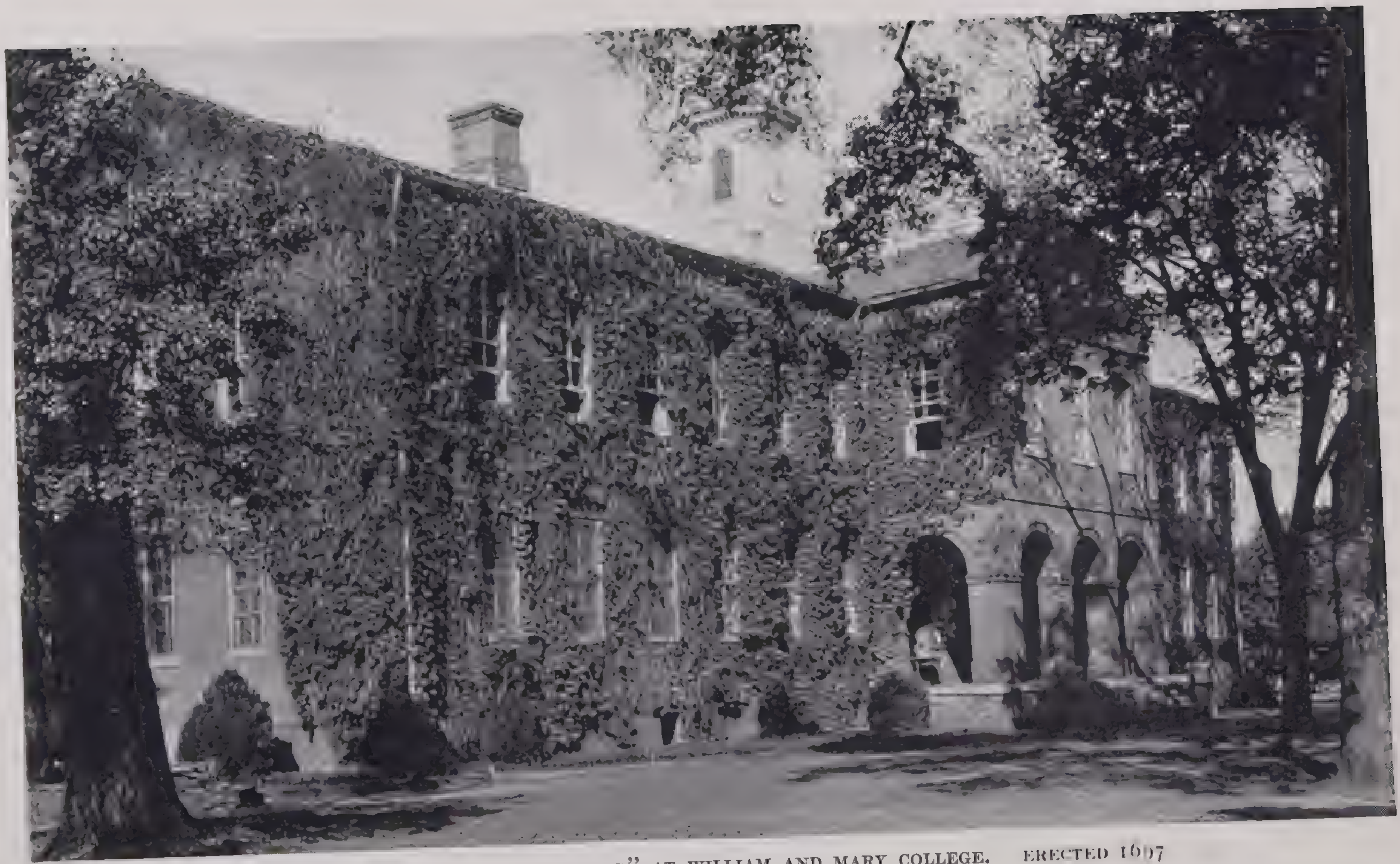
CHAPTER I

INTRODUCTORY AND RETROSPECTIVE

THROUGHOUT the cultural changes of mankind the physical embodiments of the Church, the State and the University have most successfully survived. Buildings universally admired have housed these landmarks of civilization and are preserved to us by virtue of the interest and protection of religious, governmental or educational authority. It would seem as if the phantasmagoria of change were not wholly satisfying to man, but that something must remain stable before his eyes to provide a firm foundation, as do religious faith, the love of the beautiful, the reverence for history and tradition or the verities of natural science, whence his mind may take its expansive flights. To invest an educational institution with an architectural form is, therefore, a serious matter, for it should mean building for all time, in like manner as churches and as houses of state are conceived and undertaken.

The affection of the college man for his alma mater has at least one picture sufficing to command his devotion. It is the college scene. Now the college scene is impossible to think of without its setting of architecture. What student sensibility is there unresponsive to the beautiful nave where the daily chapel was held, the stately portico where the class would group itself to be photographed, the window of the study where Cæsar was conned under sheltering eave and overlooking roofs and chimneys? And many an old grad has reflected that students may come and go, classes enter and graduate, but that venerable walls and carved chimney-pieces, picturesque gables and vaulted archways endure forever. These remain his own because always present in his mind's eye and he prays that change and decay may never reach them.

It is with this physical aspect of the college or university that we are to deal. By the telling effects of the architectural setting is the graphic portrayal of the institution made possible. This portrayal centres attention upon and soon comes to symbolize the institution, for however beautiful a natural scene, landscape alone can not identify itself until architecture enters and completes the pictorial quality. If this architectural garb is well conceived and wrought, it will minister to the daily smooth running of student and faculty lives, it will conduce to convenience and contentment, to the financial well-being of the



THE "CHRISTOPHER WREN BUILDING" AT WILLIAM AND MARY COLLEGE. ERECTED 1697 institution and to its standing in the educational world and before the public; it will, in fine, command the admiration of this and future generations.

There is no art in which this country has made more rapid strides than architecture, and our institutions of learning should embody this national progress, especially since it so effectively serves all other arts as well as the sciences and daily life. The question that now takes shape is, What is good architecture? It is not possible, nor is it our aim, to answer this by any direct formula, but rather it is hoped these pages may do so by implication. Many readers already know what is good and what is bad architecture. These persons will admit that of the money that has been spent and is being spent throughout this country for college buildings, but a small portion goes to produce those of real architectural worth, nay even of practical convenience. In asking the departments of buildings and grounds of a number of institutions what they consider their "best" building, that is, the one that is best suited to its purpose and which might serve as a model for study by the trustees or building committees of other institutions, it is surprising how hesitating the responses have been. And yet the burden of this inquiry lay with the practical side of building rather than with the more elusive and æsthetic architectural quality. Those responses can not but indicate how heavily our institutions are encumbered with archaic buildings, poorly designed and often worse built, monumental annoyances, the kind of blot upon the scene that evokes the unholy impulse in some secret breast to pray for a fire.

Fortunately, not all the old buildings are in such an unenviable estate; and it so happens that those earliest erected at the oldest institutions have an admirable character that surpasses that of the buildings of fifty or seventy years ago and holds its own with the most admired structures of to-day. Before proceeding to discuss modern achievements, let us review some of those initial buildings. They are justly regarded as sacred, not only by reason of their history and inherent age, but for their good proportions, their simplicity, dignity, truthfulness and restraint. Added to these qualities is the affection the buildings hold of students who have long had them as daily companions, and this is an affection that is hardly bestowed upon buildings devoid of any self-respecting architectural quality.

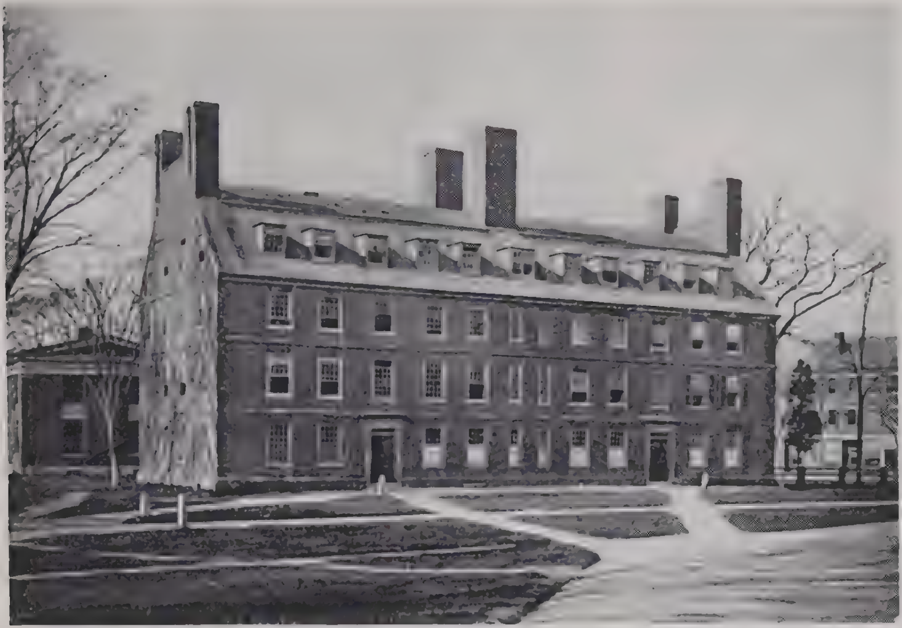
The oldest college building still existing in this country is at William and Mary College. It was designed by Sir Christopher Wren and completed in 1697. The chapel wing was finished in 1732. In 1705, in 1859 and during the occupancy of Federal troops in 1862, it fell a victim to devastating fires, the last of these having left nothing standing but the walls. After each of these disasters the building was repaired, and the present endowment programme of the college includes its restoration according to the original design of Wren. Bafferton Hall, originally the Indian School of the College and the President's house were both erected in 1732. The latter was all destroyed by fire except the walls when occupied by French soldiers after the Battle of Yorktown.

Six months after the first building erected at Cambridge had been consumed by fire (January, 1764) the corner-stone of a new structure was laid and the building, bearing the same name as its predecessor, *i. e.*, Harvard Hall, was completed in June, 1766, at a cost of $23,000. Massachusetts Hall had been erected in 1718; and as that is still standing, it is properly pointed to as the oldest of the Harvard buildings. Originally containing "chambers and studies," occupied by American troops after the battle of Lexington, converted into rooms for lectures and society meetings and examinations: after such vicissitudes, culminating in a fire a few years ago, the venerable building has been restored to its original use as a dormitory.

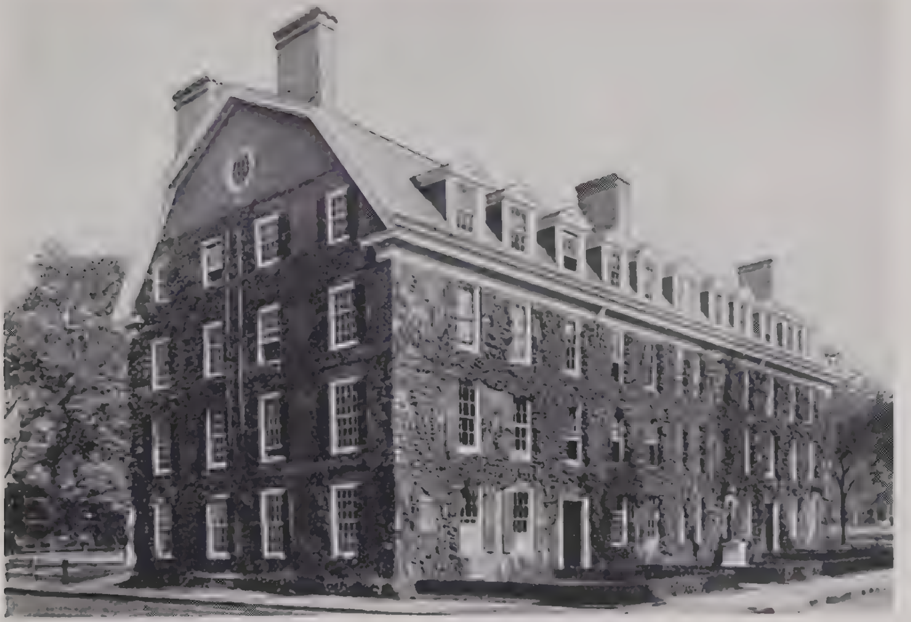
The erection of Connecticut Hall, early known as "South Middle" at Yale, had its inception in 1748 when the directors who "had concerted and drawn a Lottery whereby they had raised the sum of 5400 Pounds in bills of Old Tenor ordered that there be a new College House built with brick of 105 feet in length, 40 feet in breadth, and 3 stories high beside the Garrets, with a cellar under the whole house." By 1752 the building was in the main completed, but not entirely so, does it appear, until 1757, when a rendering of accounts placed the cost at £6725/0/10. In 1796–97 the gambrel roof was removed, another story added and the present roof put on.

Ground was broken for the College edifice at Princeton July 29, 1754. The plans drawn by Doctor Shippen and Robert Smith called for a building "three story high & without any Cellar." The building was called Nassau Hall in memory of the "Glorious King William the 3d., who was a Branch of the illustrious House of Nassau." The College was completed and the students occupied it in the autumn of 1756.

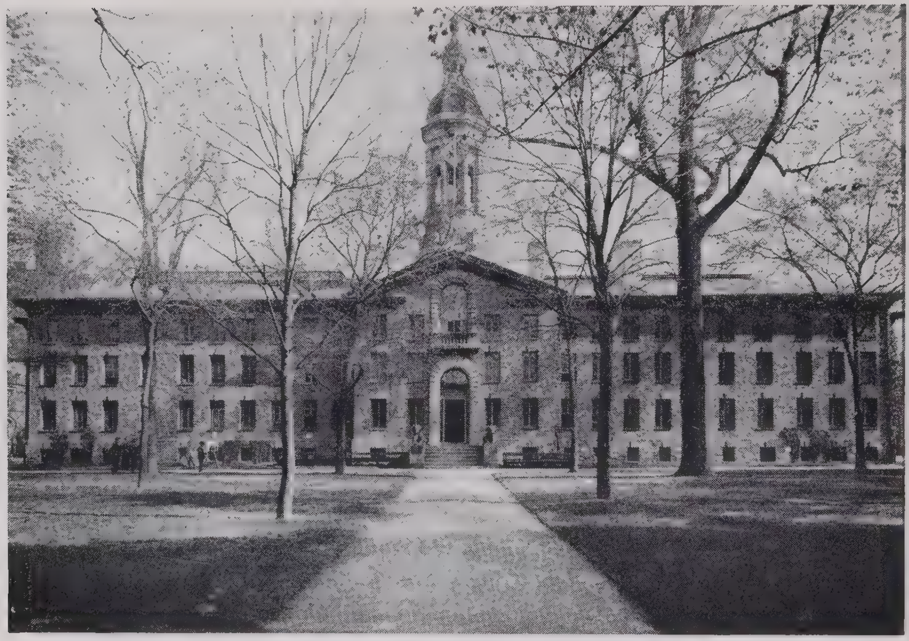
"This day they began to dig the Cellar for the College," wrote Solomon Drowne, a freshman at Brown University in his diary March 27, 1770. May 14 the corner-stone was laid and the structure was completed with a thoroughness and despatch which, if tradition be true, was aided by the liquid encouragement bestowed on the workmen by Mr. John Brown when each floor was laid and the roof was framed. The finishing of the interior progressed more slowly; but the two



MASSACHUSETTS HALL, HARVARD. ERECTED 1718



CONNECTICUT HALL, YALE. ERECTED 1757



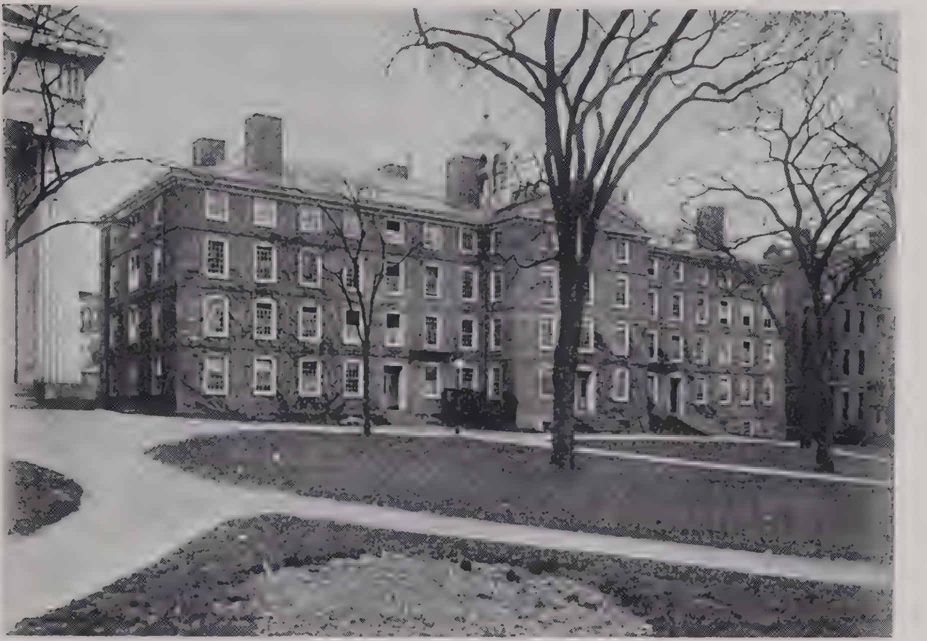
NASSAU HALL, PRINCETON. ERECTED 1756.
FROM PLANS DRAWN BY DR. SHIPPEN AND ROBERT SMITH

lower stories were ready for use in the winter of 1771-72, the remainder by 1788. In 1835 the exterior was plastered with cement, but in 1905 this was happily removed and the building restored to its original appearance.

Massachusetts Hall, a simple brick building cubical in shape, was completed at Bowdoin in 1802 and now contains administrative offices and the Cleaveland Cabinet of Mineralogy and Natural History. "Old West College," Dickinson's first building, was built in 1803 from the designs of Benj. Latrobe. This and "East College," erected in 1836, occupy prominent positions on the present campus and are still in daily use.

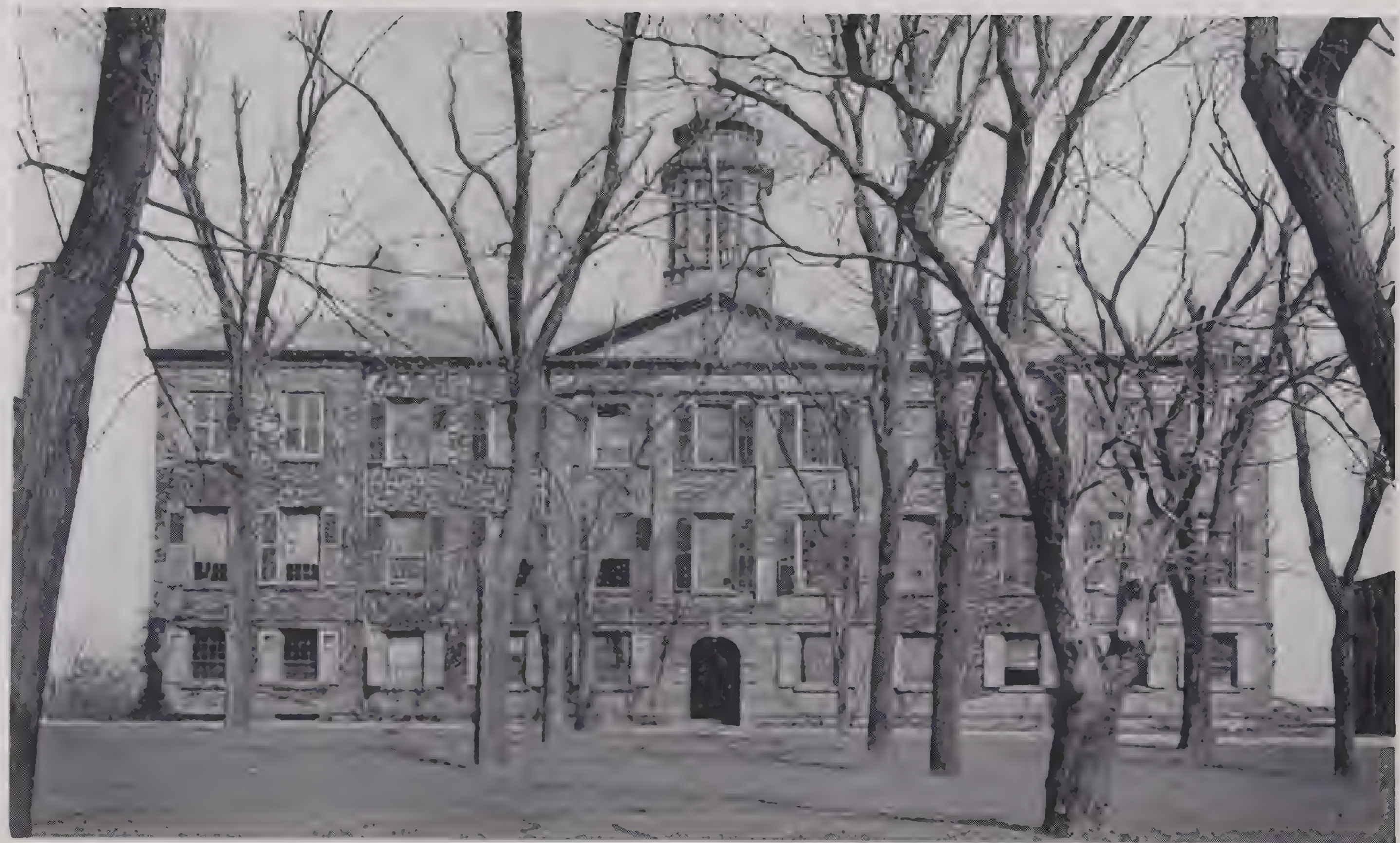
In April, 1809, the corner-stone of Queen's Building was laid, now the venerable nucleus of Rutgers College. It is a three-story structure entirely faced with dressed local stone, with a central pavilion marked by four pilasters. The cost is supposed to have been about $30,000. The designer was the well-known architect, John McComb, Jr.

The corner-stone of the Doric pavilion upon one side of the rectangular campus at the University of Virginia, was laid October 6, 1817. It was the first building of the Jefferson group and is now the Colon-

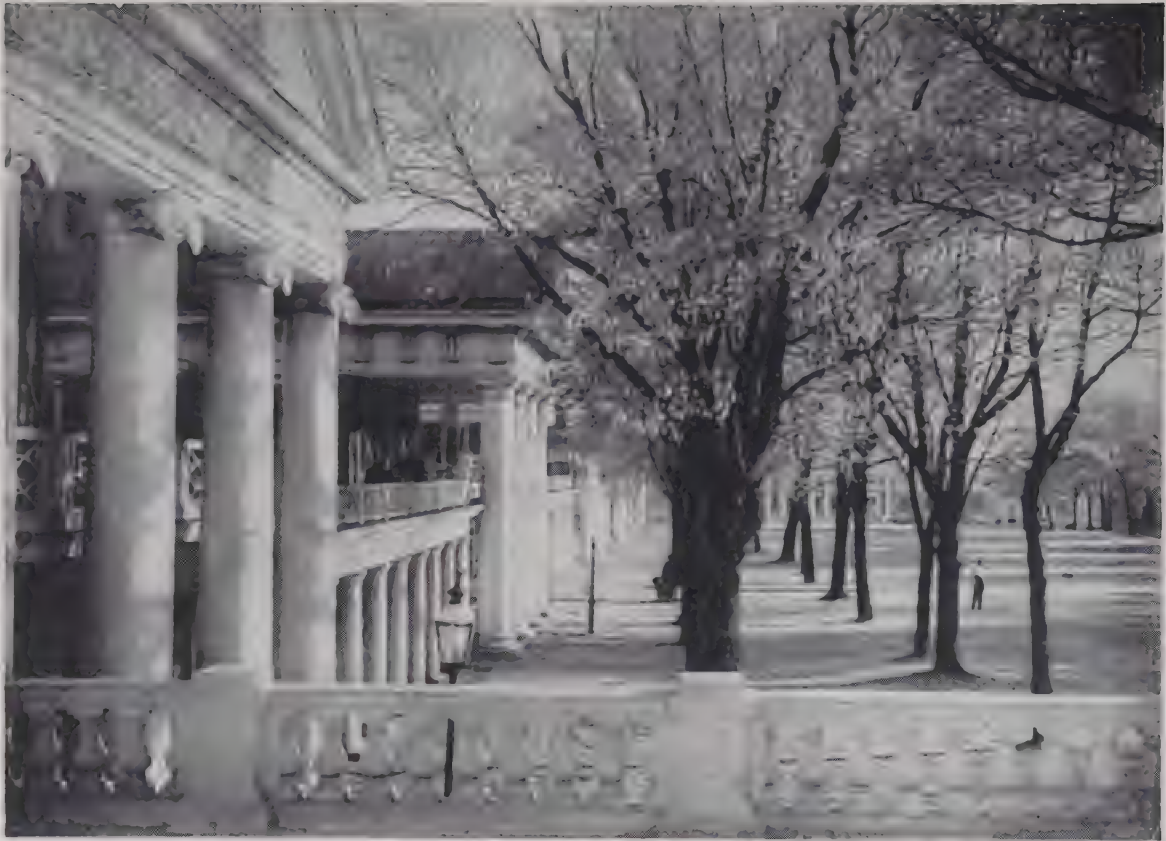


UNIVERSITY HALL AT BROWN. ERECTED 1771

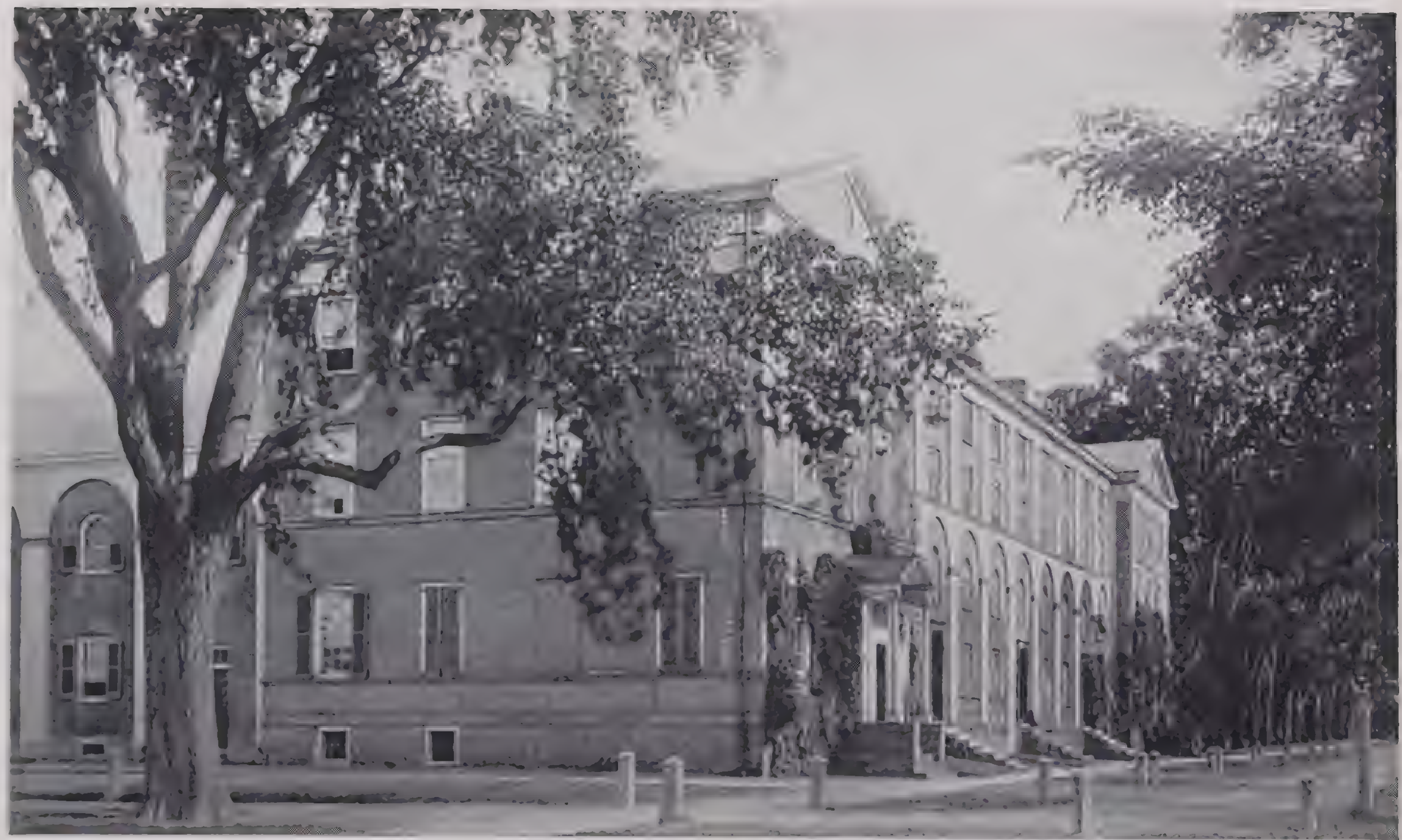
OLD WEST COLLEGE AT DICKINSON. ERECTED 1803.
DESIGNED BY BENJAMIN LATROBE



QUEEN'S BUILDING AT RUTGERS. ERECTED 1809. DESIGNED BY JOHN McCOMB, JR.



ONE OF "THE ROWS," A PORTION OF THE ORIGINAL GROUP AT THE UNIVERSITY OF VIRGINIA.
ERECTED 1817. DESIGNED BY THOMAS JEFFERSON



"SOUTH COLLEGE," UNION COLLEGE. ERECTED 1820. FROM THE PLANS OF JOSEPH JACQUES RAMÉE nade Club for members of the faculty, alumni and guests of the University.

A graduate of Union College, browsing in an old print shop in Paris, discovered in 1890 a plan for the buildings and grounds of Union College and prepared by a Frenchman, M. Joseph Jacques Ramée.[1] The scheme appears to be somewhat similar to Jefferson's for the University of Virginia, with a dominating building at one end of a rectangular space, the sides of which were to be enclosed by flanking buildings. These buildings, the North and South Colonnade, were begun in 1812 and completed in 1820.

The Buildings comprising the historic "Old Row" at Dartmouth were erected early in the nineteenth century, when bricks could be had at $3.00 per thousand, shingles at $2.00, spruce and pine hewn lumber at $9.00. Common labor was paid $.75 to $1.00 and masons $1.50 a day.

The Washington College Building, familiar to visitors to Washington and Lee University, was begun in 1824. It is a brick building 250 feet in length and with three columned porticos. The central part, three stories in height, contains classrooms and debating halls of literary societies. A terminal wing contains science lecture rooms, laboratory and museums, while its counterpart at the opposite end contains a geological lecture room and the department of education and psychology.

Old College Hall at Delaware, completed for the first term to open in it May 8, 1834, underwent an unusual operation in 1916–17. The entire interior was removed, leaving only the walls, and was replaced with a reinforced concrete structure. A new arrangement of the rooms was made, a crude cupola removed and the porticos, equally crude, were appropriately developed in the style originally essayed.

The corner-stone of the Old Territorial Building at the University of Iowa was laid at Iowa City in 1840. The building is believed to have been designed by Father Samuel Mazzuchelli. Six years later Iowa became a state; and when in 1857 the capital was removed to Des Moines, the University fell heir to this, the former capitol. The building has been recently restored at a cost of $100,000.

It is easy to realize what efforts it cost the wealthiest of the Colonies to rear their first college buildings. The struggle it has meant to other communities can be inferred in touring some of our countrysides. We see in New England an initial building, erected about the middle of the last century as a gaunt answer to a necessity, a most utilitarian look-

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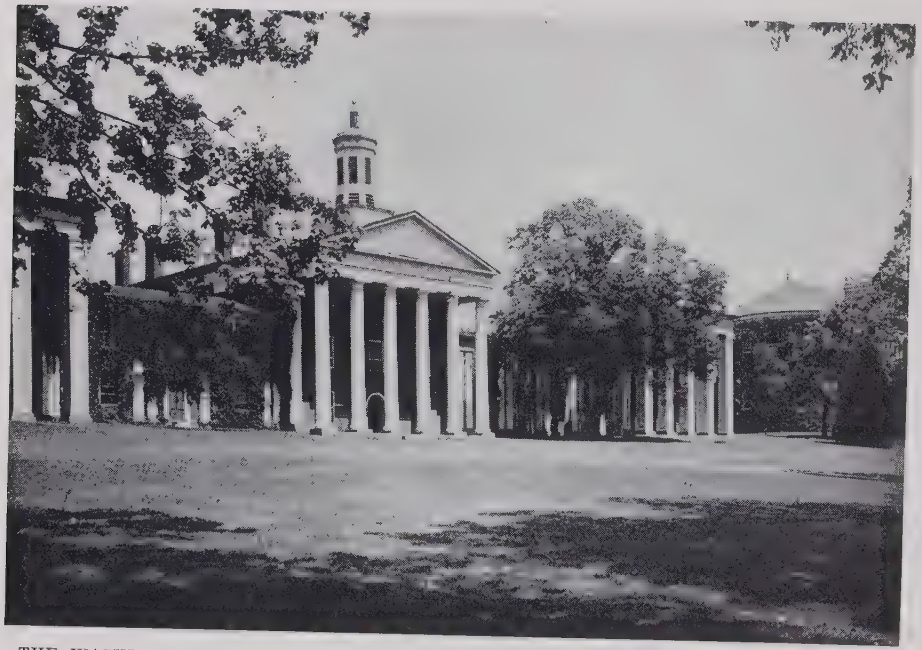
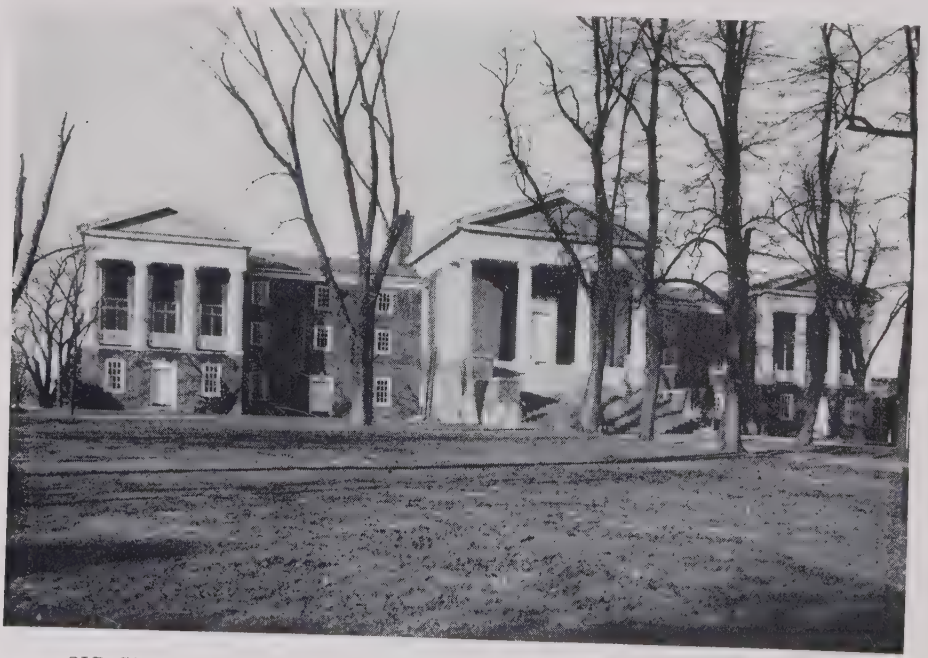
[1] "Architecture of American Colleges," by Montgomery Schuyler, IX—Union, Hamilton, Hobart, Cornell and Syracuse. *Architectural Record,* Dec., 1911, page 551.



THE WASHINGTON COLLEGE BUILDING AT WASHINGTON AND LEE. ERECTED 1824

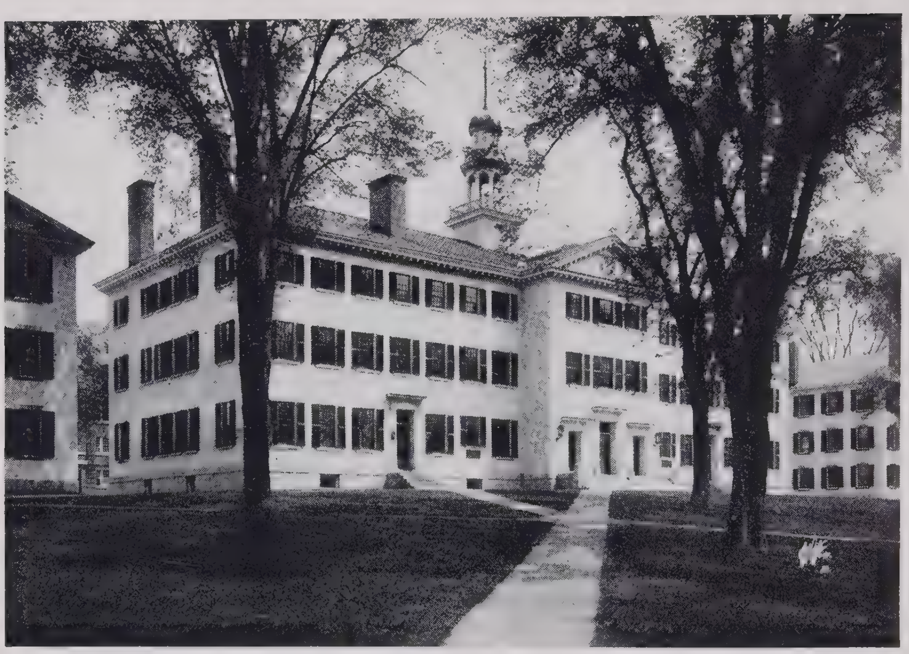


OLD COLLEGE HALL AT THE UNIVERSITY OF DELAWARE. ERECTED 1834 ing brick mass of four or five stories reared upon a long rectangular plan and with one or two square projecting bays or towers containing stairways—all very similar to the New England type of mill. Yet these first college buildings served their purpose with the means then available. Their severe austerity is now mellowed by time and verdure and they are sanctified by the human scene of which they have long been the centre. They are worthy of respect as the earnest efforts of their period.

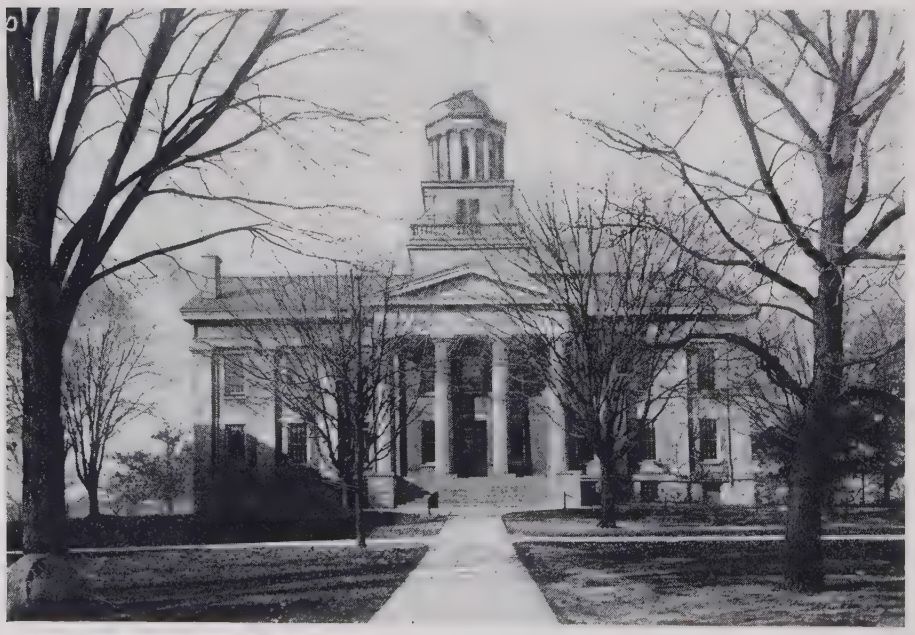
Some of the western colleges sprang from several two-and-a-half story buildings of the dwelling-house type, but another and distinctive type of initial building is found in the large halls erected between 1850 and 1870. These reveal the lack of architectural understanding and direction which was general throughout the country during the period which followed the Greek revival. They are of considerable lateral extent, of a height of four or five stories, having usually a tower, often a mansard roof or dome or even parapets, turrets and crenellations, the walls embellished with quoins, the window arches with heavy projecting voussoirs, all of which betrayed a borrowing from several architectural styles rather than a true following of any. Indeed these buildings are not unlike a magnified residence or mansion of their day. Nor was this wholly illogical, for the need of providing living quarters is present at a college from the first, and these halls—as we remember them from some of the women's colleges particularly—were places of residence though containing rooms for teaching and administration as well. As the institution grew, other buildings enabled these different activities to be separately housed. This type of initial building may be seen at Rockford, Carthage, Vassar, Illinois and Swarthmore Colleges, at the Western College for Women and, until the fire of 1914, at Wellesley. It also is found at Purdue and Dartmouth, Cornell and Rochester. Elmira's six-story structure, erected in 1855, is in a class by itself.

We have no fault to find with these buildings as they now exist, though it is difficult to dispel from the mind the hazard of fire. If they are in good repair, they present a condition and point of departure on which any plan of architectural expansion of the institution should be based.

Although the destruction by fire of a large part of Chicago in 1871 and of Boston in 1872 was of moment in the architectural history of the country, it was not until after the Centennial Exhibition at Philadelphia that an interest in the arts began to make itself felt, and the works of capable men who were leading, as it were, the infant art of American architecture out of its wilderness, began to appear at our colleges and universities. Notable indeed were the events which marked



THE HISTORIC "OLD ROW" AT DARTMOUTH. WENTWORTH, ERECTED 1828. THORNTON, ERECTED 1828. DARTMOUTH, ERECTED 1791; REBUILT 1904



THE OLD TERRITORIAL BUILDING AT THE UNIVERSITY OF IOWA. ERECTED 1840 the opening of the last decade of the nineteenth century. The influence of Richardson was seen, and the firm which succeeded him, Shepley, Rutan & Coolidge, was responsible for the design of a number of college buildings. Commissioned in 1886 by Mr. and Mrs. Stanford to develop the University which bears their name, it is believed the comprehensive plan this firm produced was the first prepared for any American institution since that of Thomas Jefferson for the University of Virginia. The first group of buildings for Leland Stanford University was opened to students in October, 1891. The first of McKim's Harvard gateways was built in 1890, followed by the Meyer Gate in 1891. The late Charles C. Haight's buildings at Yale, of which the first was Vanderbilt Hall, Cope & Stewardson's dormitories at the University of Pennsylvania, at Princeton and at Bryn Mawr were contemporaneous with Henry Ives Cobb's ambitious scheme of building for the University of Chicago (1893). Three new buildings were completed at Brown in 1891 and in the early 90's two buildings designed by Wilson Eyre were erected at the H. Sophie Newcomb Memorial College in New Orleans. Most of these buildings had as their motif an adaptation of the English collegiate Gothic. At the same time the inspiring Renaissance and Classic work of McKim, Mead & White at Columbia and elsewhere had a wide influence and was coincident with that of the greatest architectural stimulus the country had yet seen, the World's Columbian Exposition at Chicago. The buildings which resulted from the labors of all these talented men amply sufficed to kindle the desire for better things. We now behold the time as past when it could be said of our institutions of learning what Lowell said at the two hundred and fiftieth anniversary of the founding of Harvard, that the past of the New England college is "well-nigh desolate of æsthetic stimulus. We have none," he said, "or next to none of these coigns of vantage for the tendrils of memory or affection. Not one of our older buildings is venerable, or will ever become so. Time refuses to console them. They look as if they meant business and nothing more."

This unsparing comment was made prior to the awakening of the 90's, but it cannot be passed unheeded. It must have applied to some of the very initial buildings we have first mentioned. In our colleges and universities the beautiful is taught from books, but it is not always to be visualized in the surroundings of the campus. It is hoped and believed that we as a nation are now on the highroad of progress in surrounding college youth with what is enduringly good in architecture. The fond eye of student or alumnus is no longer to be deluded in its reverence of the college scene. "The picture that hearts hold dear"—to quote from a college circular—is to be made acceptable to the mind as well, that students and alumni may not gaze with indulgent affection on the accepted because familiar forms. Rather they are to be taught to value good architecture by withholding from them examples of the bad. They are to be shown that fine works of this venerable craft do not depend on size, expense, elaboration or prominence of position merely, but rather that they should embody first of all the three qualities set forth by Vitruvius: stability, utility and beauty. Though stanchly and honestly constructed and rationally planned to fulfil the purpose for which they are intended, they must have the last quality, especially, if they are to be elevated to the sphere of architecture as distinguished from engineering. Having also fine proportion, color and ornament, will they fit ultimately—if not at once—harmoniously into their surroundings, will they provide a foundation upon which age may weave its continuous and magic spell.

CHAPTER II

CONTROLLING FACTORS

EDUCATION is orderly knowledge, and orderly planning should guide the physical growth of colleges. The individuality of each institution should be sought, and in expressing it there should be method withal. Discerning architects and others who have pondered long upon the expansion of an educational institution are disposed to open their report with such words as these: "Our first thought in the study of a future development is that it should have the character of this institution." Now what is the character of a college or university which may be architecturally expressed?

A criticism justly made of us as a nation by foreigners is the uniformity which oppresses them here. This fault is probably due to the centralized control of our country, the easy and rapid means of travel and communication and the dissemination of news, advertising and other propaganda, the organization of industry on the basis of quantity production and selling, with the concomitant chain store, the chain hotel, the chain restaurant and the chain bank, threatening in time to make of us all a chain gang. It is not to be supposed that our colleges and universities will capitulate entirely to the psychological habits of unthinking imitation which leads to this monotonous uniformity touching all of our lives at numerous points and presenting a real intellectual and æsthetic danger. It is rather to be believed that institutions of learning will cherish the influences which are realized to be distinguishing to each and will so foster them as to insure a vivifying diversity. Whether these influences lie in the rich historical backgrounds of the old institutions of the Original Thirteen, in the origins of the colleges of the Plains States, those of the mountain regions, of California or the South, whether they lie in social or in economic differences of the communities, or in the purpose of the institution and its curricula, there is enough, it seems to us, to afford each college its own footing in its own locale, to create its own surroundings and plant in its own way and to suit its own ends.

There is always some measure of tradition in the shortest span of history; and since education is so largely built upon the achievements of the past, it would seem appropriate for any college, however young, to have some salient circumstances of its past reflected in its architecture. Another theme upon which the architectural designer may play is the site. There should be no scheme either of education or of architecture that is not firmly rooted in Mother Earth. Aspiration begins there. And the architectural conception should be guided by what is appropriate to mountains, to rugged knolls with rock outcroppings, to more amenable rural and suburban sites or to places amid unbroken horizons of the plains. There is an individual quality, too, for the penetrating eye in almost every landscape setting. Each site has its topographical merits and disadvantages. These, as well as those subtle qualities connoted by the word aspect, should be taken into account in locating the buildings.

Another ground for differentiation lies in climate. This plays a part, not only in the general planning and posture of the buildings, but upon the materials of building. The climate of the far South has caused the most characteristic and charming buildings there to be built low—thereby avoiding resistance to hurricanes—and of brick plastered with cement on the exterior. The permanence of plastering in the mild climate gives wide scope for color and architectural detail of which any visitor to the Vieux Carré at New Orleans is soon convinced. In fact plastered exteriors are seen in abundance in some of the oldest and narrowest streets of Charleston and Savannah, and this same material is supposedly well adapted to the climate of Southern California. Further north, where winters are more rigorous, exterior plastering is not enduring, and exteriors of brick are found satisfactory. Where suitable building stone abounds, the excellence of this material renders any urging of its use superfluous. Prevailing winds should be taken into account. In the North Atlantic states, at least all buildings for student residence should turn a cold shoulder to the north, while extending their open arms to the south and west.

The character of the student body, the method of teaching and the special branches taught, if any, are still further conditions that may differentiate institutions and prevent the mere copying by one of the architectural style and layout of another. Such a special branch of instruction certainly exists at the Naval Academy at Annapolis, yet another at West Point. The speed and character of growth is another condition. Some institutions are eager to increase their student body, others are limiting it by one device or another. One at least, realizing the desirability of a small unit, contemplates expanding by a duplication of the unit. Others are determined to retain their character of a single small college, resting their choice of this ideal upon the value of close human contacts or a number of other obvious advantages enjoyed when a periphery is not too far from the centre.

These considerations of past and present character should be controlling factors in the design and planning of buildings or groups of buildings. A remaining condition is as important as any. It is that of location with respect to the immediate community, that is to say a city, a suburban or a rural location, for here is involved the potent force of land value with its effects so far-reaching as sometimes to control the destiny of institutions, confining them or permitting them to expand, sometimes causing their removal bodily to another locality.

Of institutions situated in cities, Columbia first comes to mind as the metropolitan university. The physical conditions governing its inception and growth are unique because a metropolis itself is unique, —for each country at least. When the site, originally a large residential estate with fine old trees, was shown to the elder Olmsted, the trustees asked that some of the trees be saved. Upon seeing the building programme proposed, Olmsted knew how completely it would occupy the land and he declared they could save none. Then and subsequently the problem of land at Columbia has bulked large. Bounded as this University is by city streets intersecting each other at right angles, and occupying what is the most valuable land devoted to any institution of learning in this country, a rectilinear, formal style of architecture was imposed, the group necessarily compact, with only sufficient space between the buildings to give the necessary light and air and architectural effect. Horizontal expansion being difficult, increased space within buildings has been obtained by rearing the new structures higher than the old. In the main group, having the library as its centre, an effort toward architectural harmony is now seen in the keeping of the principal cornices of new buildings the same level as those of the old, but with several stories added above the cornice in the new buildings. On adjacent lots the structures have reached a height of fifteen stories. But all this is insufficient for the increasing demands and additional plants have been established at 165th to 168th Streets and Riverside Drive,—the new Medical Centre,—and for athletic purposes at Baker Field, not to mention the down-town centres.

Similar problems are encountered by other institutions in large cities. Harvard has expanded, not conspicuously by accretions to its present holdings, but by a leap across the Charles River to a large level tract where it has established the new School of Business Administration, of itself as extensive as many a college. Yale has sought to disentangle itself from the city of New Haven and to become a visual entity. Pittsburgh is building toward the sky. Pennsylvania has been obliged to turn an attentive ear to the offer of a large tract of land near Valley Forge, twenty miles from Philadelphia. The University of

Chicago, with its ninety acres, appears to be fortunate in controlling sufficient land to suffice for a long future period of expansion. Western Reserve in Cleveland and the University of Cincinnati feel doubtless no little concern at the rapid rise in the values of city real estate which has been so marked since the late war.

Next we have to consider the institutions in towns of twenty to fifty thousand population. Cornell, in occupying its commanding plateau, may be safely aloof from the encroachments of growing Ithaca. Washburn is but two miles from the centre of Topeka's 50,000. Lafayette is at bay between the city of Easton and the Delaware River. The University of Chattanooga is in the heart of its city of 44,000. Elmira College is but one mile from the business centre of Elmira with 45,000 population. The University of Nebraska is in the same relation to Lincoln with 55,000, Franklin and Marshall to Lancaster with 53,000, Rutgers to New Brunswick with 33,000, Bates to Lewiston with 31,000. Randolph-Macon College for Women is within the corporate limits of Lynchburg with 30,000 population, but as this College has sixty acres extending to the James River, encroachment of the city would appear remote. Similarly the University of Kentucky—but a half mile from the main street of Lexington—may add to its sixty-four acres by acquiring the adjoining farm land. The rate of growth of the communities is all-important. In the West, too, the corporate limits of cities greatly exceed in area their densely built portions. Land is generally more easily obtainable than in and about the old centres of the East. Here years are consumed in rounding out a building site, no right of eminent domain coming to the rescue; and in some cases development plans are long kept secret in fear of the effect their publication would have on the prices demanded for needed lots.

Some sites in the centres of cities have been abandoned by institutions moving outward, leaving only the medical, the dental, and the law departments to function amid the dense population. If our cities continue to grow, as they will, we shall see more such spectacles. Whether there is an urge within the institution to expand or not, there is a temptation to sell the city site at a price which might be sufficient to permit both the acquisition of a much greater area in the near-by country and the erection of several buildings as the nucleus of a new architectural group. If an additional building or two should then be contributed and the success of the new project assured, the wisdom of the step is obvious. The gage of progress is thrown down. Modern buildings are obtained for old ones. In a beautiful and inspiring setting breathing space is found. Enthusiasm is aroused at the access of new life. The institution demonstrates that it has the courage to put into practice many of its own teachings. To use the language of the street, "It gets on the map."

Physical inability to expand in the town may force such a step as described. Indeed, we have been asked by trustees whether their colleges are at present overbuilt or not and whether their plants should be moved. We confess to having no answer, and we do not believe there has ever been any formula devised to establish the maximum college population permissible per acre. A latitude is provided by architecture. Witness the large land holdings of institutions with small student bodies in the West and South and the other extreme, at the University of Pittsburgh, a lofty tower structure being erected that is to have a daily population of some 5,500.

In 1912 when the first steps were undertaken by the Massachusetts Institute of Technology to move from its six acres adjoining Copley Square, Boston, it had 1,500 students of whom probably one-half commuted daily to their homes. There were practically no recreational facilities. The present site across the Charles was occupied in 1916. Less than nine years later an officer wrote: "We have approximately 3,000 students with 300 living in our own dormitories, which number we hope soon to increase to 800. We have also erected a large Student Club House and have an Athletic Field immediately adjoining our educational buildings." Here is proof positive of the wisdom of removal and the impetus to be derived therefrom.

Another notable case of removal was that of Johns Hopkins from the Howard Street site near the centre of Baltimore to the 120-acre tract at Homewood. The Louisiana State University has recently moved from within Baton Rouge to a 2100-acre tract three miles away. The H. Sophie Newcomb Memorial College moved in 1918 from a single block on Camp Street, New Orleans, to ample holdings facing open country though still within the corporate limits of the city. Goucher College is now in possession of a magnificent tract at Towson, six miles north of Baltimore and adjoining a large old estate bearing one of the finest Colonial mansions in existence. To this new site the College intends to move as soon as finances permit.

Institutions situated in the country or on the borders of boroughs face no such ineluctable fate as indicated above. This does not mean that they have no land problems. Funds may be lacking for ever so reasonable a purchase, and struggles may be engaged in against influences inimical to the institutions and with land as a weapon. The Mr. Jekyll holding a key lot blocking an improvement otherwise assured proves to be a Hyde before an opportunity to exact a high price. A large building for an eastern university had to be shifted fifteen feet in its location at the last minute because the university could not buy the end house of an adjoining row. The Shylock in the background was discovered to be an alumnus.

The peaceful existence of those institutions occupying suburban locations at a safe distance from cities and the undisturbed beauty of their properties demonstrates the wisdom of the founders who have chosen the sites. Such locations as a class have the greatest number of advantages and the least of disadvantages. Of institutions so located may be mentioned:

Boston College, Wellesley and Wheaton, near Boston.
St. Stephen's and St. Elizabeth, near New York.
Bryn Mawr, Haverford, and Swarthmore, near Philadelphia.
Rosary and Lake Forest, near Chicago.

Tax-supported institutions may have under some state laws the power of condemnation of land which would free them of such fetters as described, but on the other hand these institutions have problems peculiarly their own. The necessity of accommodating whatever number of students may apply for admission, construed as an obligation to the community, a demanded responsiveness to varying tides of public interest and opinion and to political influences as well, may be mentioned among the conditions faced by the institutions which every member of a constituency claims as his own.

In conclusion it may be said that the most potent and impelling controlling factor of all is money. Trustees and administrators know full well the anxieties involved under this head. Whether for new buildings or the maintenance of old ones, whether for faculty salaries, endowment scholarships, a new department, library enlargement or what not, dollars are the life blood of the institution and must be sought from public spirited citizens or from publicly constituted bodies or both. That it may be effectively and wisely spent when obtained is ardently to be desired and it is hoped these pages may help toward this end, that it may not be written of American universities centuries hence what the distinguished English architect, T. G. Jackson wrote of a venerable one in his own land, "The record of buildings at Oxford since the end of the sixteenth century is one of continuous disorder."

CHAPTER III

GENERAL DEVELOPMENT PLANS

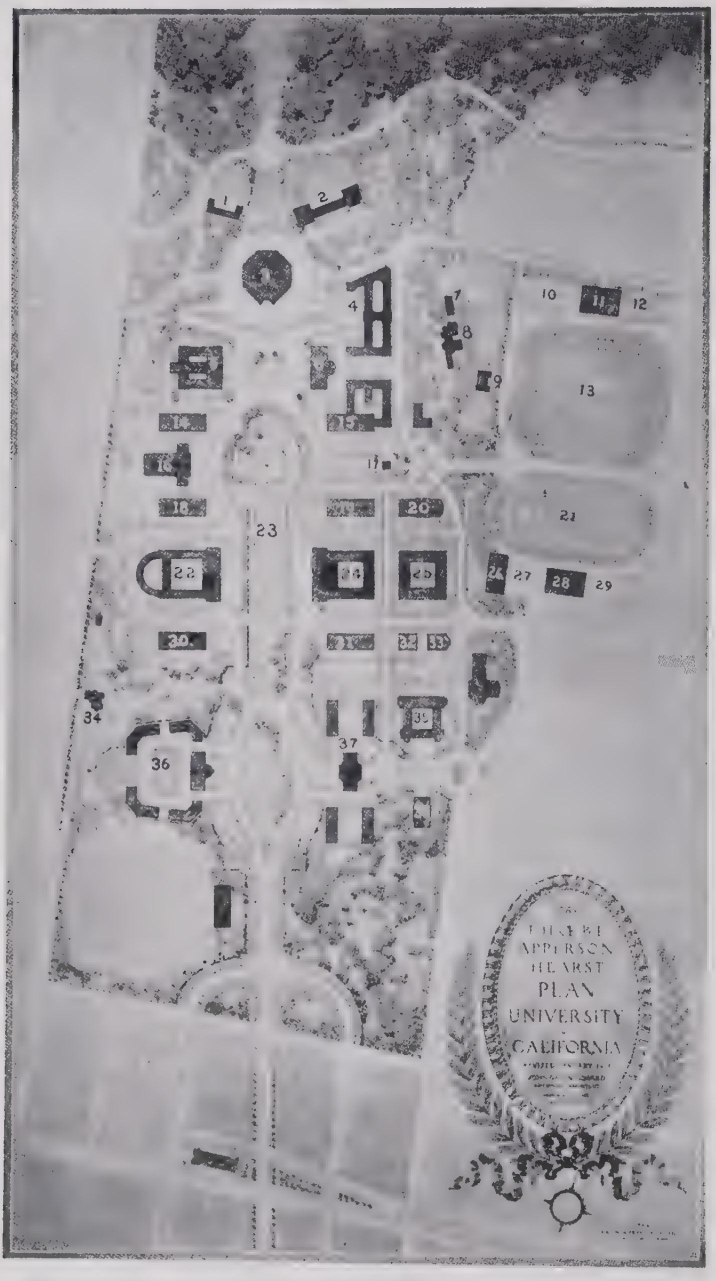
A GENERAL development plan is a scheme of disposition of present buildings and designated sites for future ones, so conceived as to coordinate all and render them an integrated whole while permitting expansion of any separate unit. It is conducive to beauty of the scene and architectural effect, to convenience of daily use and to economic and effective administration.

The American public has had in the World's Fair at Chicago and several subsequent expositions signal object lessons in such well-studied layouts of groups of buildings. Akin to these have been the numerous splendid projects proposed for city planning, a field which had its inspiring inception in the promulgation in 1902 of the Senate Commission's Plan for the improvement of the City of Washington, D. C.

The scope of a world's fair is known, its limits practically fixed, rapid and continuous progress of construction assured, and a guiding mind in control—all these contribute to simplifying the design and execution of a general plan. But in cities and elsewhere a state of flux is encountered. Unmeasured change and the indeterminate future must be taken into the reckoning. In city planning, great things have been expected, but comparatively little achieved because of a combination of impediments, of which may be mentioned conflicting jurisdictions, vested and political interests, inextinguishable tenures and franchises, the demands of trade, the sensitiveness of real estate values and the selfish vigilance of those who speculate in them.

A public or private institution such as a college or university, occupying its own tract of land, is not so hampered. It is peculiarly well situated to reap the inestimable fruits of forethought and skill in planning. Nowhere is it more essential to have the physical plant beautiful and well-knit together; nowhere should it be more feasible to enlist the careful thought of well-trained minds, to weigh and reconcile all component parts, to profit by the past, to measure accurately the present, to forecast the future as well as it can be forecast, and in the end to yield to the sway of one mind which must be elected to prevail. We have called this kind of planning an art; it is also a science.

The international architectural competition instituted in 1898 by



THE PHŒBE A. HEARST PLAN FOR THE UNIVERSITY OF CALIFORNIA, BERKELEY. (REVISED JANUARY, 1914.)
JOHN GALEN HOWARD, ARCHITECT

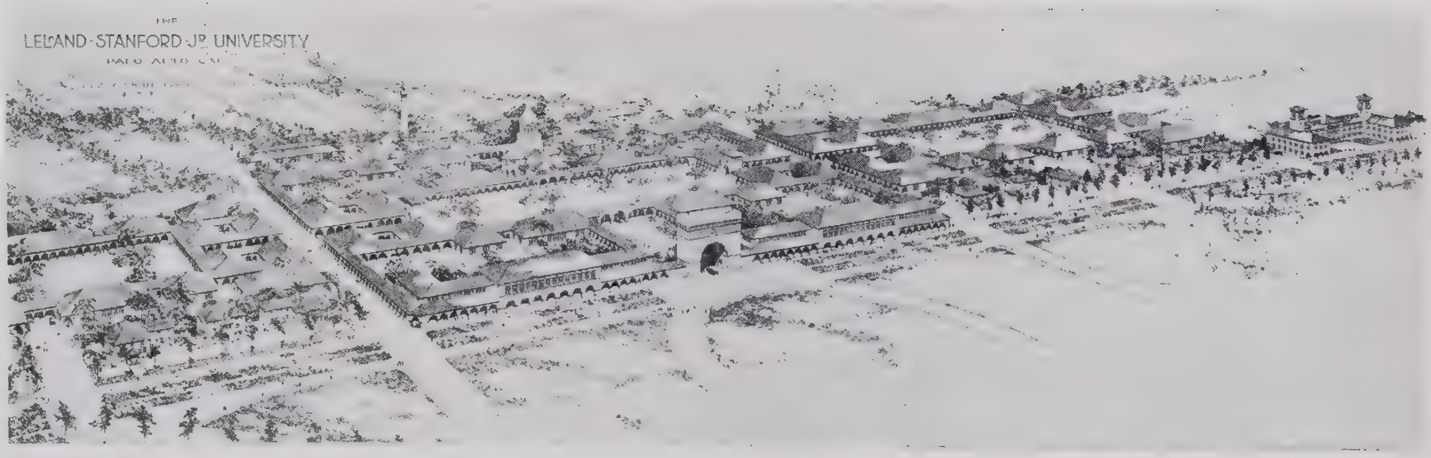
Mrs. Phœbe A. Hearst for the development of the University of California at Berkeley was the occasion of an entire university's being laid out upon a virgin site. Columbia, Washington University at St. Louis, and others occupied themselves in putting their architectural houses in order. Many others followed until now, in a survey of two hundred leading institutions of learning in the country, it appears that at least one-fourth this number have instituted some general plan for their orderly development.

Why a development plan, what does it aim to accomplish, to what extent does it succeed, are questions that might be asked by a practically minded trustee.

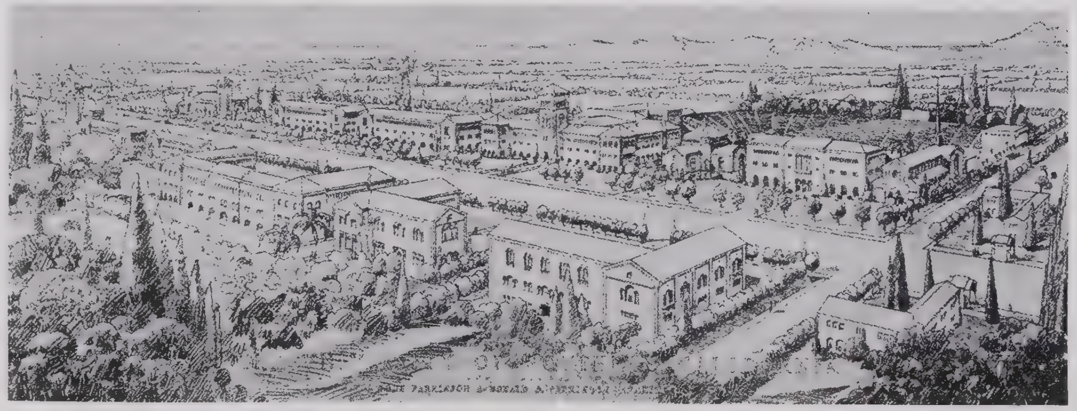
Upon visiting a well-known college where a library was under construction, it was noticed that a substantial and far from obsolete building was to be demolished to make way for the new. While the old building was not architecturally fine, it was not obtrusively bad; it was substantially built and would have served a good purpose for a number of years to come. A development plan, which would have visioned the future, would have avoided this loss due to one structure claiming the site of another.

The key-note of a general development plan is *order*. It has been written that this is Heaven's first law. It is also the first law of knowledge and it should be the first law of institutions whose business is to discover and to disseminate knowledge. It prevails in the church, the state and should prevail in every home. Order, then, is the guiding star under which a development plan is desired, conceived and followed. That the group of buildings shall not be a motley jumble of structures so located as to be at odds with each other, displaying discordant styles, erected at haphazard, confusing to beholders and irritating to occupants, but rather that it should be a homogeneous, clearly to be apprehended scheme, in which there is a studied and happy balance of things, of buildings located with regard to their functions, importance and architectural effect, of natural views conserved and topographical advantages skilfully exploited. Indeed, the development plan not only conserves views, it creates new ones in the form of delightful vistas projected between rows of buildings and ending at an imposing architectural mass embellished with entrance, tower or dome, or else the view may be flung far into a magnificent distance over a lake, a river, a valley or toward a distant mountain.

If a practical argument be needed for a development plan, let the case of a manufacturing plant be considered. Every large industrial concern has gone through exactly what the universities have experienced. At factories departments have expanded and new buildings have



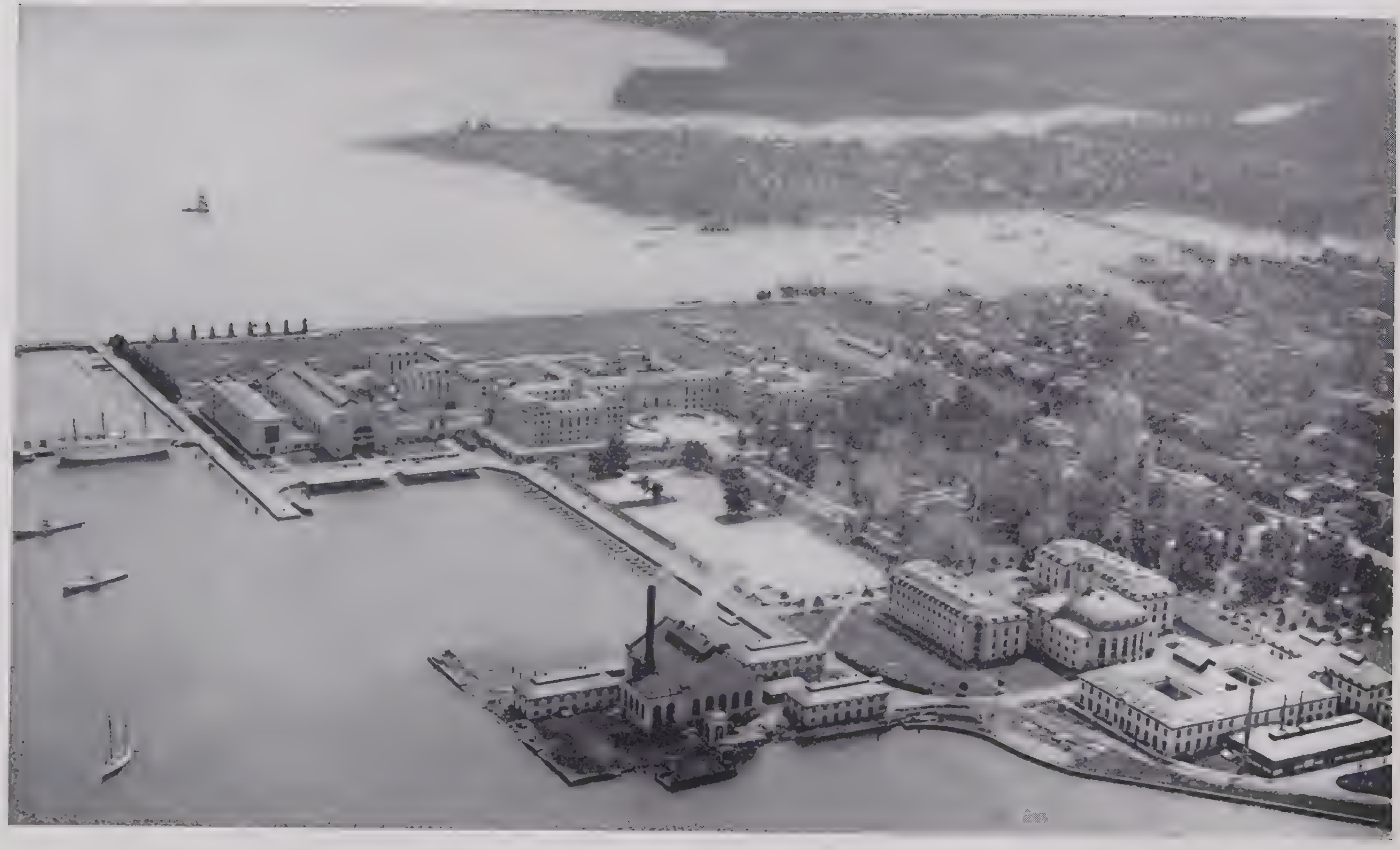
GENERAL DEVELOPMENT PLAN FOR STANFORD UNIVERSITY. PREPARED IN 1886 BY SHEPLEY, RUTAN & COOLIDGE, ARCHITECTS, AND F. L. & J. C. OLMSTED, LANDSCAPE ARCHITECTS


JOHN PARKINSON & RONALD B. PARKINSON ARCHITECTS

DEVELOPMENT PLAN FOR THE UNIVERSITY OF SOUTHERN CALIFORNIA. JOHN PARKINSON AND RONALD B. PARKINSON, ARCHITECTS been erected. A shop superintendent, needing more space and seeing an open lot of ground beside him, "decided to put the new building there." The site appeared right to him and that was the end of it. He or his successor has wanted another building, and he has placed it in another open space; and still another building, and another have thus been located upon the impulse of the moment, whether their sites were suitable or not in the opinion of others but the few concerned. After a time the result is complete confusion. As each section of the plant needs to expand, it is found that none can do so for lack of space. A story is added to an existing building only to shut off light from another. Easy circulation for men and materials is destroyed. Improvement of processes and rearrangement of details of the plant encounters a wall of resistance whose stones are shortsightedness, timidity, whims of individuals, unwise economy and narrow vision. Many an industrial plant has found it good business to scrap the whole thing and begin to build anew. Upon pointing this out to university boards of trustees a member exclaims, "That's just what we had to do with our steel plant." Another says, "We had to do the same thing with our ore-loading docks." "We scrapped our mine plant and village two years ago and began all over again," adds another.

In these industrial cases dollars and cents were at stake. At institutions of learning the parallel is a close one. Their very existence may be at stake. True, they do not require the movement of raw materials to the storehouse and then fed out to the different processes and at the other end the outward movement of the finished product, but institutions of learning have many other requirements. The factory accommodates a population while it is working: the college while it is working, studying, sleeping, eating, worshipping and playing. Hence the college plant consists of three primary divisions, *teaching, housing, recreational.*

Having started with three or four buildings, as was often the case, a college in growing finds one of these interferes with the growth of another. Before long the original uses must be abandoned; the structure must then be revamped and forced to serve new uses, with varying degrees of success and dissatisfaction. A college officer may argue that it is impossible to foresee the direction in which his institution will grow. The demands made upon a certain department may become fourfold in a few years. Economic and social changes may bring new conditions and problems. A donor may bestow an entirely new department. An alumni uprising may insist upon changes of an unforeseen trend. Quite true. But notwithstanding these uncertainties some main outlines may be discerned as fairly permanent, and a few avenues of



UNITED STATES NAVAL ACADEMY AT ANNAPOLIS. ERNEST FLAGG, ARCHITECT probable growth laid out and architecturally expressed. Details should be left entirely open for future development, for it cannot be too strongly emphasized that a development plan should deal with things in the large. It should be basic only. Hence no development scheme should ever be adopted except "in principle."

If a new site is considered or land added to an old one, the tract of ground should be ample as measured by the needs of the future as well as the present. It should be accessible with reference to the various and changing means of transportation. Consider for a moment automobiles. Although their use by individual students is discouraged at some colleges, this means of transportation makes headway and is imperious in its demand for parking space. This is particularly true in the West, where students are obliged to reach the college daily from their homes many miles distant. It has even been suggested that the institution of the future should have fields for the landing and departing of individual airplanes.

Of manifest importance is it that the site should be beautiful. "The value of beautiful surroundings as a refining and educational influence can scarcely be over-estimated as an element in the life of the students; and since the university can also make its strongest appeal to the sentiment of its alumni and to local or state pride through a commanding situation and the dignity and beauty of its buildings, the trustees may well afford to strain its resources to the utmost in order to secure the most desirable site, rather than accept even as a gift, one less desirable."[1]

The topography plays a vitally important part in any development plan. If the site is level a symmetrical and formal scheme is generally conceded to be the most appropriate; although there are cases where such a scheme has been carried out upon a hillside and this by means of terraces and greens upon different levels. Sweet Briar College presents such a case. Rugged and irregular sites generally require a similarly irregular grouping of buildings, if for no other reason than to fit them to the ground. These two types of group plans are exemplified in the two national institutions, the regular and formal on the level shore of the Chesapeake Bay at the United States Naval Academy, the irregular and picturesque upon the highlands of the Hudson at West Point. Other examples of the formal type on a large scale are the group-plans for the Universities of Illinois, Minnesota, Oregon, Arkansas, North Carolina and Delaware, for Washington University, St. Louis, and for the Massachusetts

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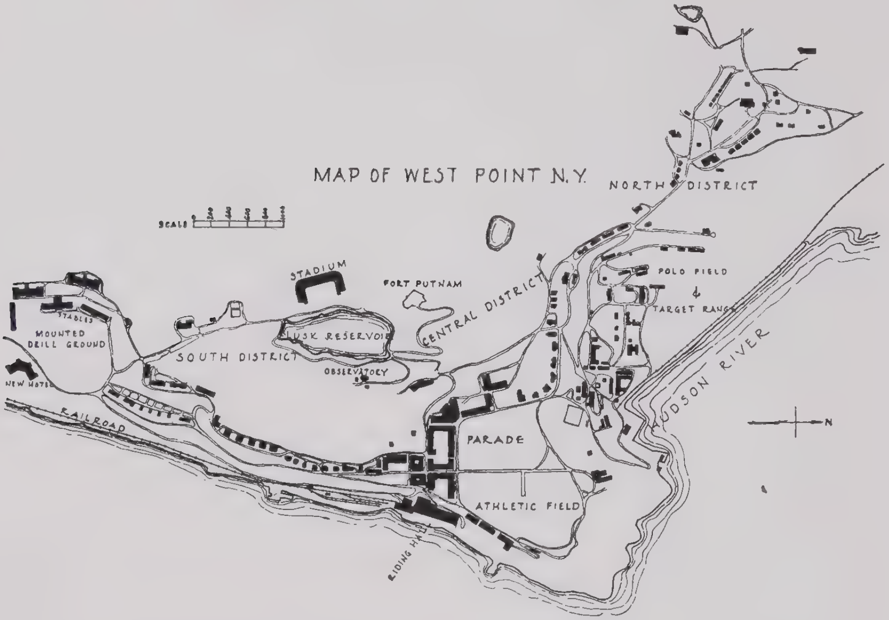
[1] "Notes on the Building of a University," by John B. Pine, *The American Architect,* December 2, 1914, reprinted in the *Educational Review,* March, 1915.



GENERAL PLAN OF THE UNITED STATES MILITARY ACADEMY AT WEST POINT

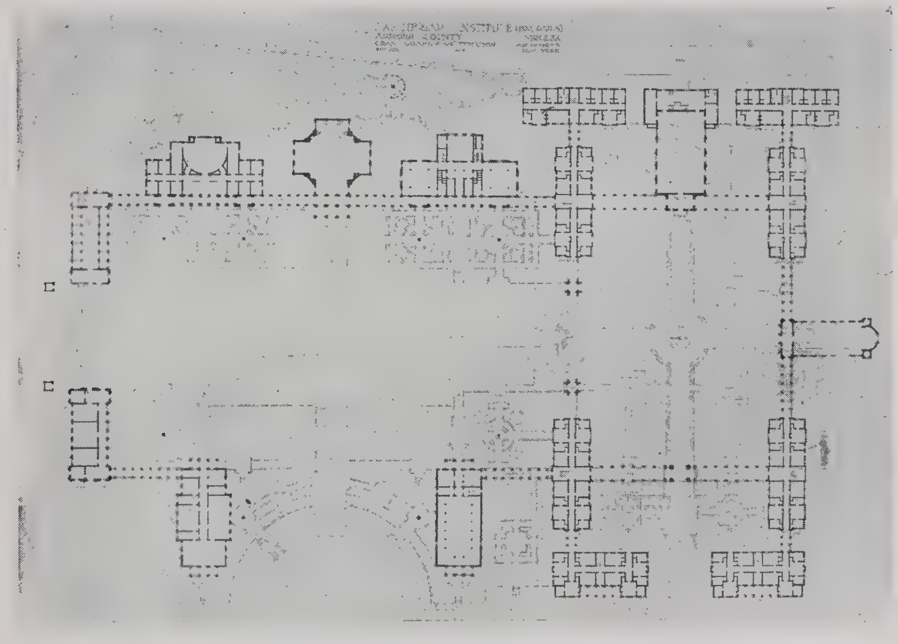
Institute of Technology. Upon a somewhat smaller scale are those for the University of Virginia, for the Harvard Business School, for Rockford and for Illinois Colleges.

It is manifest that the forms of these have been imposed in most cases by the street plan surrounding them. At the Universities of Illinois and Oregon right angles prevail throughout, while at Minnesota and at Vanderbilt the presence at one end of the property of streets running obliquely has induced a part of the plan to respond to these angles. A similar condition is present at Emory. At the University of Rochester, however, a right-angled plan has been adopted upon a plateau within the bend of the Genesee River where natural boundary lines are quite irregular. At Johns Hopkins there are street boundaries on one side only and the terrain is quite irregular, yet two groups, each based on right angles, have been devised. The scheme at the University of Southern California is to group the buildings upon each side of a central avenue or mall. For the University of Wisconsin a splendid programme of development has been produced in which the hill ascending beside Lake Mendota is made to yield very fine effects.

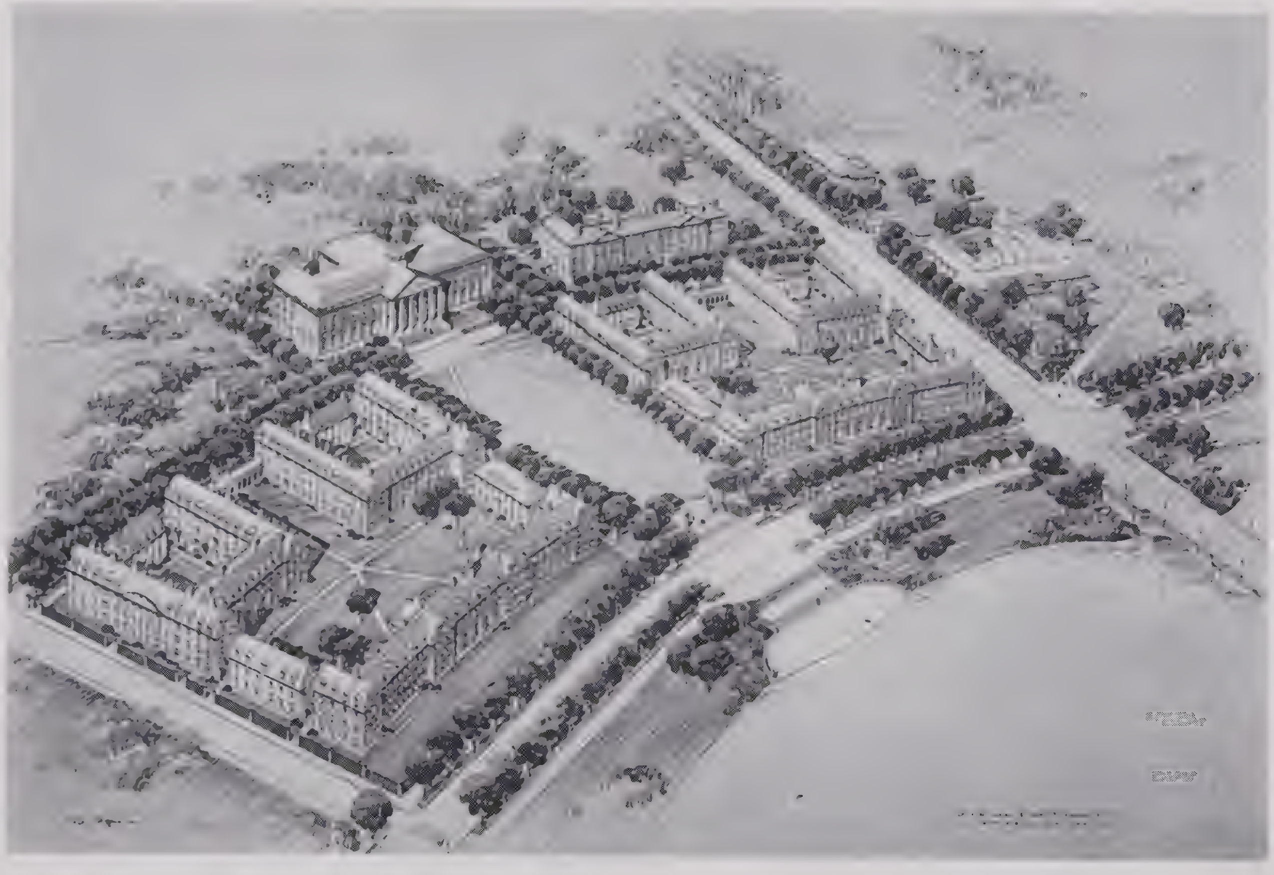
Examples of the informal type are to be found at Princeton, Wellesley, Cornell, Lafayette and Wells College. The new Duke University is set astride of a wooded ridge. The carefully studied plan for Denison utilizes a crescent-shaped glacial moraine.

In a formal scheme the axes are laid out upon the drawing board and building sites are disposed by a balancing method. In an irregular scheme there are fewer axes to begin with and they are predetermined by the topography. Upon leaving these the buildings continue in a rambling manner carefully studied for picturesque effect and usually with happy results, for there is present here the delight of unexpected views, fleeting glimpses, abrupt changes of levels, stairways and terraces, and a charm and animation born of ingenuity and imagination in the designer.

It is a sound dictum that axes should have their termini upon enduring objects of prominence and not upon any accidental or ephemeral thing. The number of axes may vary, but in the formal style at least the fewer the axes, and hence the simpler the scheme of grouping, the more effective the result. The formal scheme also presupposes that the height and proportion of each building will be limited. In the informal scheme variety has freer play, yet the dominating masses and



A GENERAL DEVELOPMENT PLAN FOR SWEET BRIAR COLLEGE.
CRAM, GOODHUE & FERGUSON, ARCHITECTS



THE HARVARD BUSINESS SCHOOL, CAMBRIDGE. McKIM, MEAD & WHITE, ARCHITECTS gradation of height should be carried out as the architect pictures them to himself in laying out the plan.

The traditional seat of learning was that of a cloistered world. Within forbidding walls that kept out the madding crowd there was a realm of quiet conducive to study and contemplation. In ancient times no doubt this idea of sequestration was coupled with that of defense. In modern times, and in the New World especially, little expression of this idea is to be found. It is questionable, however, whether the idea of a college being a withdrawn and secluded place should ever be wholly abandoned. Athletic activities could not be so, of course; but by making the rest of the college a place apart from jarring traffic can most student activities best be fostered and the inspirational value of fine architecture realized. In thickly populated communities continuous buildings forming a rampart along the street and enclosing an open area or college yard within the block is often an admirable arrangement. It is found in the group of dormitories at the University of Pennsylvania. At Columbia buildings are erected on the street line and walls connect them. The grade of the campus being ten or twelve feet above the street grade, the separation between the public thoroughfare is complete. Another example where the maximum space within the buildings group is retained is the University of Chicago. The eastern and part of the southern boundaries of Bryn Mawr are now a continuous line of dormitories, punctuated by towers containing entrance archways. Open as the main group at Harvard is one feels instinctively upon entering the gates that he is treading a better earth.

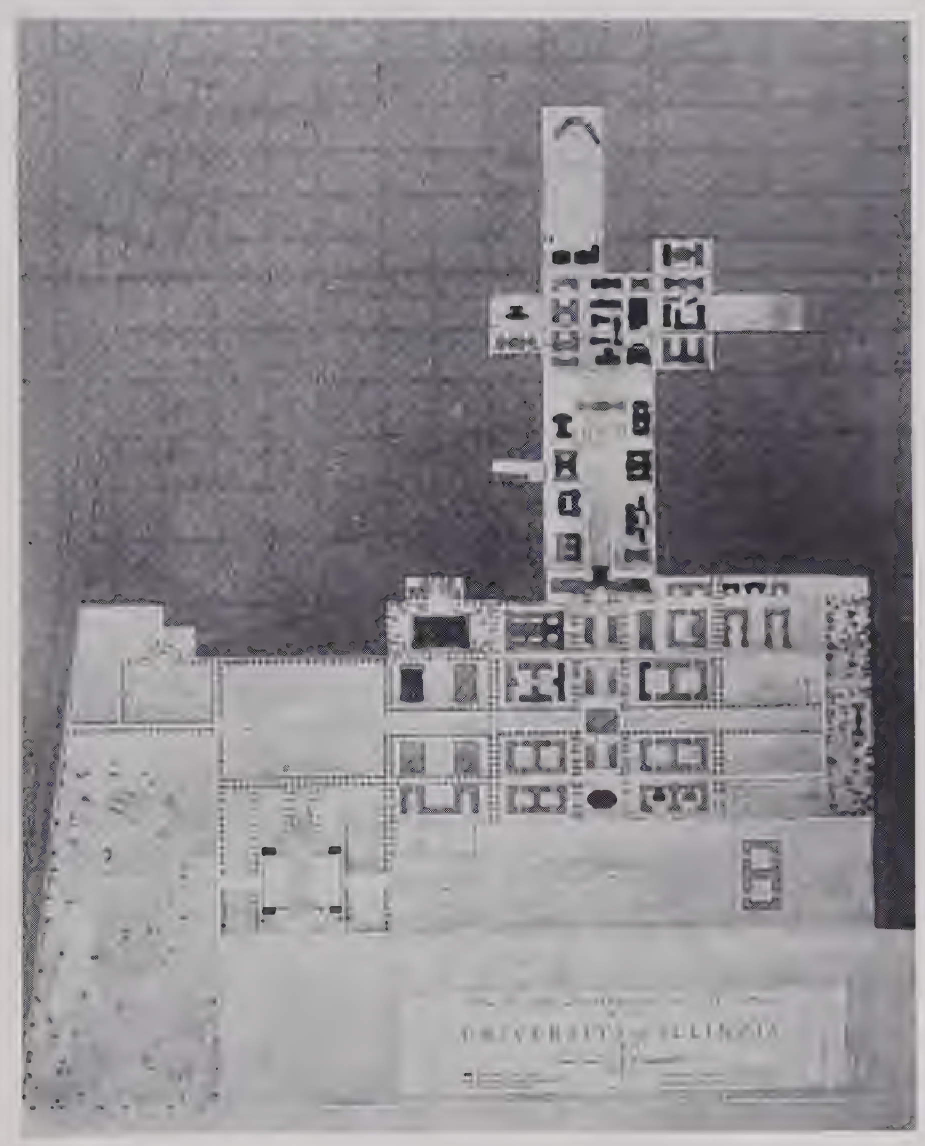
The great majority of institutions in this country, however, are situated within or on the edge of boroughs or small towns where there are open spaces upon all sides and the effect is suburban and park-like. The habit has been to make the college grounds equally park-like, to spread the buildings about in a nothing-to-conceal manner. The buildings are not closely joined and there is as much space outside the group as between the buildings. The danger of such a layout is that when each building is set in the most beautiful natural spot to be found these spots are destroyed and there is left neither the beauty of the landscape nor the beauty of a group. This park-like manner may answer some demands, among which is the necessity of keeping the buildings, especially the library and chapel, away from noisy streets, but the best architectural effect is gained by a more compact grouping. Notably in the case of dormitories, scattered buildings afford no recompense for the loss of those beautiful and tranquil enclosed or partly enclosed spaces, or quads as they are found at Oxford, Cambridge, Princeton and Yale.

The reader will understand that the plan of any large building will take a form somewhat similar to that of a game of dominoes. If there are groups of buildings, they will remain similar to this game in character, but will be enlarged. If the style is formal, the dominoes or units of buildings will lie nearly always at right angles with each other, and will take one or more of the well-known forms of U H L E F T Z.

For a building unit like that indicated above to lie close to and opening its arms to a busy public thoroughfare is manifestly objectionable. For it to open upon a quiet suburban thoroughfare is better. For it to open upon no public thoroughfare at all is best. It is always a misfortune for a public thoroughfare to run across a college or university campus. At long settled institutions the public highway is a condition of their existence, but if an institution is settling upon a new site every effort should be made to thrust public avenues to one side in order to have none upon the campus, but those that the college can call its own, which it can regulate and the traffic of which is not obtrusive or alien to the life of the institution itself. It cannot be too emphatically stated that the central unit of the campus—the central green—should have no thoroughfares but footpaths across it or beside it. Yet we have seen development plans the centre of which is a wide public avenue and the buildings arranged in an approximately straight row on either side of it. This would seem to offer a continuous distraction to students and would deprive the university for all time of that distinction which comes from having a domain of its own. Universities like Wisconsin and Rochester in having their campuses securely removed from public thoroughfares are well advantaged.

In fixing the location of buildings the architect inclines toward placing them in a few main categories such as these:

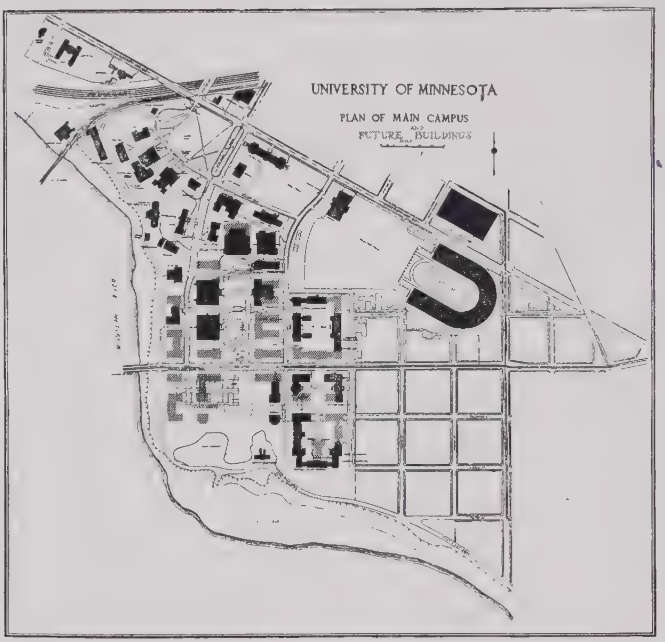
1. Those which provide for administration and functioning of the group as a whole, such as executive offices, post office, store, and, transcending these but serving the whole group, the library.
2. Those which serve the intellectual development of the student, such as academic buildings and those devoted to the liberal arts.
3. Those which minister to the spiritual life, such as the chapel and the divinity school.
4. Those devoted to the teaching of the sciences.
5. Those which serve the development of the students' physique, such as the gymnasium and the stadium.



PLAN FOR THE DEVELOPMENT OF THE CAMPUS, UNIVERSITY OF ILLINOIS.
J. M. WHITE AND CHARLES A. PLATT, ARCHITECTS

6. Those which provide for his daily living and constitute his college home, such as dormitories and dining halls, union building and Y. M. C. A.
7. Residences for the president and members of the faculty.
8. Fraternity houses.
9. The utilitarian group of central heating and lighting plant, etc.

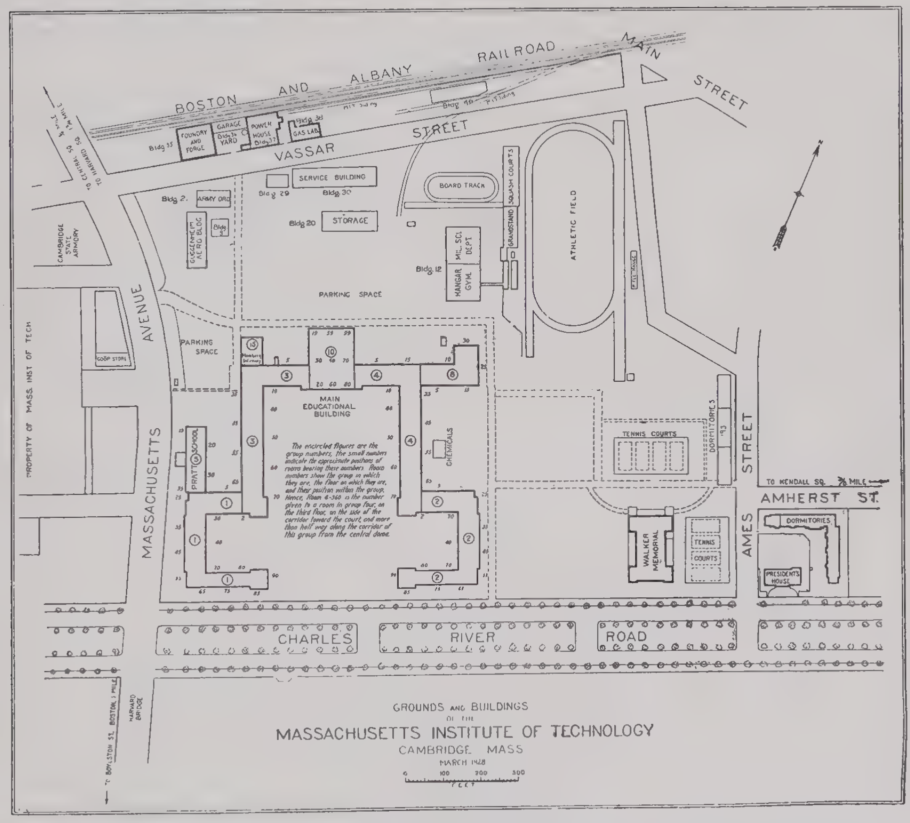
It is well to regard a library as perhaps the first of all buildings constituting a source of knowledge and to place it in a central location. As it is a building of monumental character and having a considerable mass, it lends itself to playing a dominating architectural rôle.



GENERAL DEVELOPMENT PLAN, UNIVERSITY OF MINNESOTA.
CASS GILBERT, ARCHITECT

Perhaps the four most important buildings might be selected and placed at the cardinal points of the compass, disposed around or confronting the library. These might be an administration building (including classrooms), a liberal arts building, a science building and a building for home economics, law or business science. The chapel

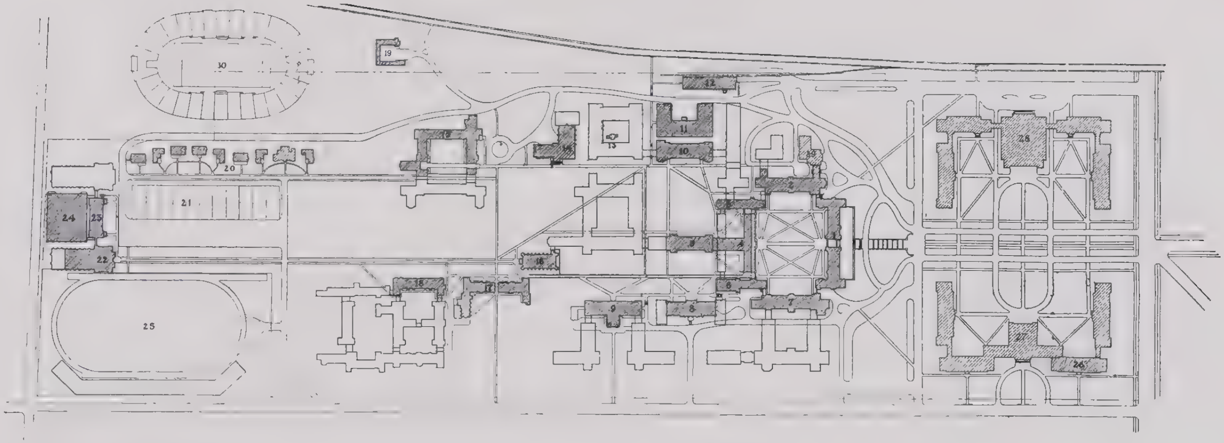
MASSACHUSETTS INSTITUTE OF TECHNOLOGY. PRINCIPAL COURT AND MAIN ENTRANCE BUILDING. WELLES BOSWORTH, ARCHITECT



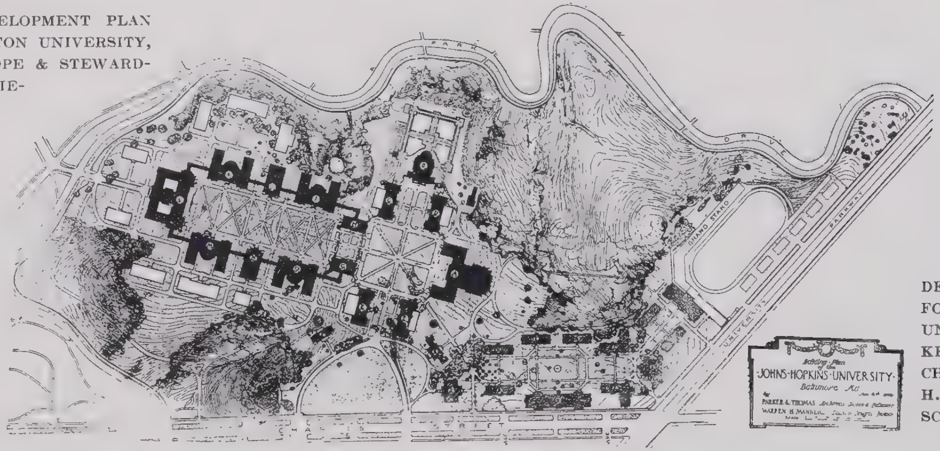
The encircled figures are the group numbers, the small numbers indicate the approximate positions of rooms bearing these numbers. Room numbers show the group in which they are, the floor on which they are, and their position within the group. Hence, Room 4-360 is the number given to a room in group four, on the third floor, on the side of the corridor toward the court, and more than half way along the corridor of this group from the central dome.

GROUNDS AND BUILDINGS
OF THE
MASSACHUSETTS INSTITUTE OF TECHNOLOGY
CAMBRIDGE MASS
MARCH 1928

GROUPING OF THE BUILDINGS AT THE MASSACHUSETTS INSTITUTE OF TECHNOLOGY



GENERAL DEVELOPMENT PLAN FOR WASHINGTON UNIVERSITY, ST. LOUIS. COPE & STEWARDSON AND JAMIESON & SPEARL, ARCHITECTS



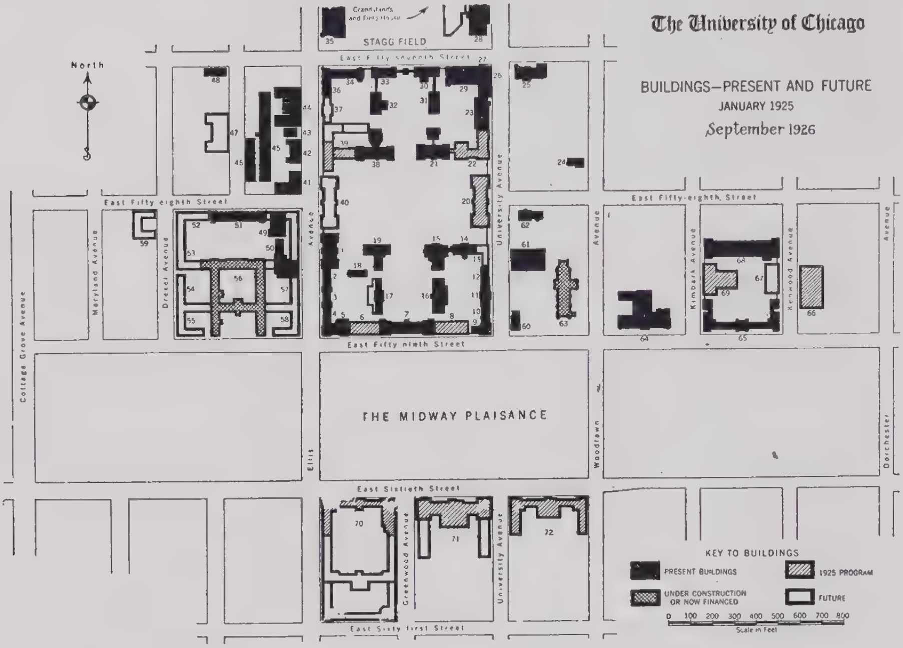
DEVELOPMENT PLAN FOR JOHNS HOPKINS UNIVERSITY. PARKER & THOMAS, ARCHITECTS ; WARREN H. MANNING, LANDSCAPE DESIGNER should be isolated and not attempting to counterbalance any other building. It is desirable to segregate dormitory buildings from academic buildings and groups of women's dormitories from those for men. It is reasonable to place a dining hall near a group of dormitories and to place buildings for the applied sciences in a group by themselves, if only for the reason that they approach factory buildings in character and outward appearance. Obviously a gymnasium should be in proximity to the playing fields. An auditorium should be easily accessible to the public as well as to the students, that is to say, near a main public thoroughfare and where there is ample parking space, yet if there are car lines on the street the building should be set far enough away to escape disturbing noise.

The sciences which stand out pre-eminently are chemistry, physics, biology, geology; but in late years these divisions are not so well defined as they formerly were because there are now biochemistry, industrial chemistry and psychology. At some colleges it is thought that psychology is akin to physics, whereas at other institutions it is thought reasonable to place this department in or near the liberal arts group. It is desirable to forbid the erection of fraternity houses on the campus proper. The reasons for this are given in Chapter XIV.

The central heating plant should be located at a low level so that the condensed steam may be easily returned to the boilers and in order also that this structure be not unduly conspicuous in the group. Other considerations, however, make it desirable that the power plant be a close neighbor of the technical schools, because it constitutes an object for study and demonstration.

In determining the posture of buildings, as much heed should be given to the spaces between the buildings as to the buildings themselves, that is to say, the voids are as important as the solids. One is reminded of the wheel whose usefulness depends upon the void at its centre. These spaces must be well proportioned in themselves and to the adjacent or surrounding buildings. They must everywhere insure abundant light and circulation of air, for these are the prerequisites of cheerfulness and spell the banishment of gloom.

This question of courts and the proximity of building to building is one on which the architect and the officers of an institution frequently disagree. In some of the large universities in the East the distance between buildings is so great that twenty minutes is consumed from the end of one class until a student sits down in a class in another building remote from the first. There was no particular reason for such a condition and it should be avoided by new institutions. Buildings should be compactly located. Especially where there is plenty of



GROUPING OF THE PRESENT AND FUTURE BUILDINGS
AT THE UNIVERSITY OF CHICAGO

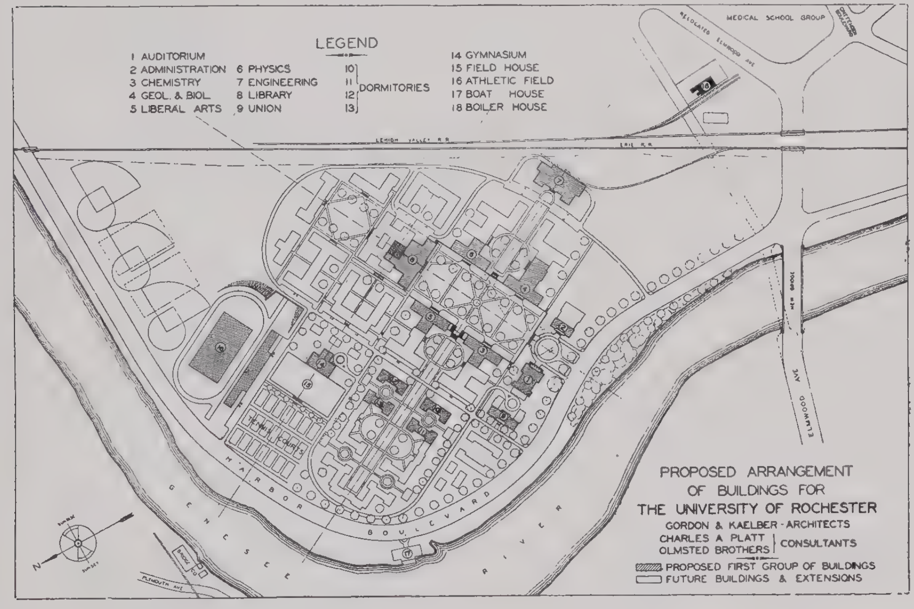
land for a college or university, the building committee often desires between buildings what to the architect seems like vast spaces, thus frustrating any attempt to arrive at an architectural solution where one building serves to enhance, because of proximity, the value of another. The architect, if he is proficient in his art, realizes that when there are several buildings to design there is greater opportunity for fine architectural effect than is possible when he is to design but one, and to attain this effect it is imperative that the buildings be set as close neighbors.

The largest campus court may well be as small as 200 x 400 feet, but if dormitories be arranged around a quadrangle, that space should not exceed 160 feet each way or, if a parallelogram, an area equal to 160 x 160 feet. Indeed, smaller courts than these are often more delightful and intimate. We adjure college officers not to insist on large courts, quadrangles or open spaces. By adherence to this rule a happy architectural solution is greatly aided.

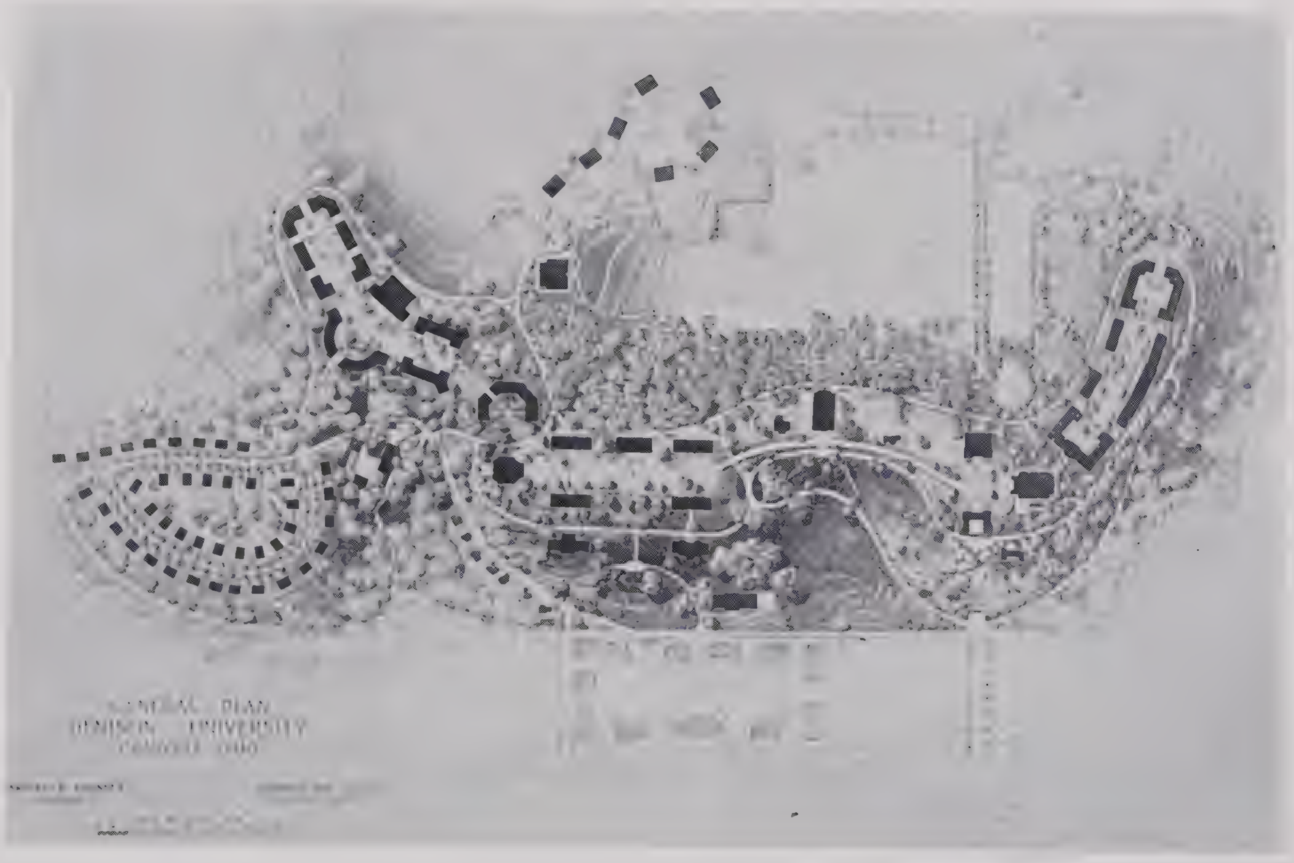
There are places where the climate is such that it may be inexpedient to have closed courts or quadrangles. In such cases they should be open at the corners, or the buildings may be arranged around three sides. Of course, due consideration should be given to the prevailing summer winds.

To conduce to economy of administration there should be no needless repetition of units answering the same purpose, such as kitchens and dining halls. In order to centralize control there should not be an unnecessary number of entrances between the buildings or grounds. The fall of the land should be utilized for effective surface and subsurface drainage, and there should be no unnecessary distances to be traversed by the drain lines or by the arterial system of heating and lighting.

The "college yard" was a name given in former times to the space enclosed by a group of buildings. The rectangular stretch of greensward enclosed by the courthouse, the capitol and some of the venerable homes of the ancient town of Dover, Delaware, has always been known as "The Green." The same name has been appropriately given to the level green or campus enclosed by the new buildings at the University of Delaware. At Columbia the space north of University Hall



PROPOSED GROUPING OF BUILDINGS FOR THE UNIVERSITY OF ROCHESTER. GORDON & KAELBER, ARCHITECTS; CHARLES A. PLATT AND OLMSTED BROTHERS, CONSULTANTS



GENERAL PLAN FOR DENISON UNIVERSITY.

ARNOLD W. BRUNNER, ARCHITECT; FREDERICK LAW OLMSTED, LANDSCAPE ARCHITECT is also designated on the plan as "The Green." The modern term "campus" is the level space within the main enclosure, between the college buildings or lying beside them. This too has changed its meaning as the buildings have expanded and increased with the growth of the institutions. It has now a more extended meaning and comprises all the centrally located property of the institution.

The matter of names is important. The elder Olmsted always gave a name to each feature of his park plans, a principle of which the visitor to Boston is aware upon reading the names of field, hill, wood, felsway, arborway, playstead and the like. Upon improvement plans of colleges and universities there is opportunity for identifying walks, terraces and other open spaces as well as halls and decorative rooms by means of names having imaginative and literary value. Addison, by his daily habit unconsciously bestowed a name upon the walk at Magdalen College, Oxford. Perhaps official naming might forestall a too prompt awarding of epithets by the students. An imposing living hall, with open timber roof adorned with carved figures of conventionalized eagles was recently completed at a women's college. Long before the workmen had departed adventuresome students exploring the building named this room "the bird cage." Expressive? yes. Eradicable? no.

The development plan completed, approved and accepted in principle by the board of trustees, there comes the test of the directing mind and will of the institution. Temptations to depart from the plan are strong, the departures sometimes threatening the entire goal that has been set; and sometimes defeat is sounded by those who were but yesterday sponsors of the plan. A college president displaying a development plan now rendered forever impossible by the misplacing of a building at a vital point, ruefully explained that "Money for a library was offered by a donor who insisted upon that site for it, and—well, we were badly in need of a library."

Now, a development plan is a thing of long and mature study by many minds. It is publicly exhibited and all persons interested in the institution have opportunity month after month and year after year to criticise it. It has stood the test of time and should be considered in its main features inviolable. It has evoked enthusiasm. It has called forth gifts and these gifts should be made to further and not thwart it. Courage on the part of the governing officers is necessary. Fortunate indeed is the institution the development of whose physical plant is long in the hands of a wise and wide-visioned autocrat who brooks no detours in reaching the goal of a fine architectural plan.

The choice of a style will be influenced primarily by the nature of the terrain, the nature of the boundaries, the traditional identity of a style with the locality in question. Of scarcely less importance are the suitability of the style to the purposes of the buildings to be erected, to modern methods of construction and the proportion of architects who are skilled in the use of the style adopted, which means the breadth of the professional field from which an architect may be selected. Architectural styles fall into these two main divisions:

The Formal	*The Informal*
The Classic or Renaissance, Georgian, Colonial, regular, symmetrical, rectilinear.	The Gothic, or picturesque and irregular, unsymmetrical.

The qualities of the formal style are well known. The classic dignity of symmetrical motifs has a stateliness and repose enhanced by a nearly uniform skyline, by a repetition of parts, an exact spacing of windows, an emphasis of horizontal lines and the level bases or terraces upon which in most cases buildings in this style are set. The acme of the formal is in the monumental style, examples of which are found at the University of Virginia, at Columbia, at Wisconsin, Minnesota, Iowa State, the Massachusetts Institute of Technology and in some of the buildings at Harvard and at Michigan.

A measure of departure from the monumental, yet retaining the qualities of balance and symmetry and the effect of the repetition of identical motives, is found in the Georgian style. This is exemplified in numerous buildings at the Universities of Illinois and Delaware, at Brown University and at Pennsylvania State College.

An informal style is more flexible. Its masses can be moulded to fit a rolling ground without the necessity of extensive grading. It renders easy the providing of light, for its windows can be accommodated to the sizes and purposes of the rooms and can be single or grouped. The Gothic style is free and adaptable and is even hospitable to a few classic motifs if skilfully introduced. The present partiality for this style in some parts of the United States may be ascribed to the great exemplars Oxford and Cambridge and the weight of English tradition in American life. As those institutions are essentially residential so are the great majority of ours. The architectural vicissitudes through which the separate units or colleges on the Don and Cam have passed, such as the addition of stories, the completion of quads, the addition of wall dormers and the like, only confirm the claim of adaptability and elasticity for this, the Collegiate Gothic style.

The irregularity of levels and angles, the wide-spread diversity, the heavy roofs, the steel casement window frames and sash account for much of the expense of a Gothic building. Therefore, to build in the Gothic style is somewhat more costly than in the Georgian, for the structural framework of the latter is simple. There is much repetition and the roofs may be set behind parapets, and being thus unseen, can be of the cheapest durable material. Yet to build in Gothic will not equal the outlay for a Classic or Renaissance structure, with columned porticoes and the wall faces of ashlar. Any style chosen should afford variety while insuring the harmony of groups.

CHAPTER IV

ADMINISTRATION AND ACADEMIC BUILDINGS

Administration Buildings

Where administrative offices of a university are to be found is known only to those who know the institution. The stranger depends on the taxi driver,—and the taxi driver doesn't always know. Sometimes he lands the visitor at what is merely the largest building. This happened to be in one case a girls' dormitory, whence the writer was directed to a small one-story building, housing certain officers, around the corner. At a large institution in the Middle West nearly an hour was spent at finding the buildings and grounds department. A campus guard and several students questioned were alike uninformed. With the help of the telephone it was finally located temporarily encamped in an uncompleted laboratory room of a medical school. At that institution administration was found to be housed at seven different points, pending, to be sure, the erection of an administration building which had been duly planned, its site determined and the kind Fates invoked—though in vain—for its realization. Indeed, if the stranger visitor takes the trouble before starting out to examine in the university catalogues the plans of the grounds and descriptions of the buildings, he is often foiled in the attempt to locate the administrative offices. Particularly is this true at the older institutions or where—whether old or new—the buildings of the college intermingle with those of the town in which it is situated. Sometimes administration occupies mere left-over space and must often move as the demand for teaching rooms encroaches, minor administration being unwillingly the most notorious of such squatters. Thus we are led to remark that administration might be located with more consideration than it has hitherto received.

Administration may be said to consist of four main divisions:

Academic administration as represented by the president, the dean and the conferences of the faculty.

General and business administration, as represented by officers of the corporation, the comptroller and the registrar.

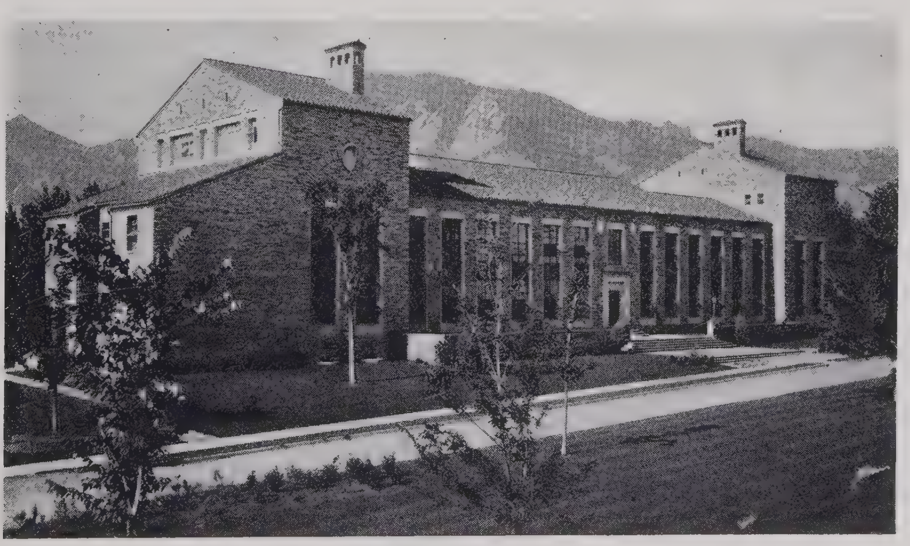
Subsidiary administration as conducted by alumni, undergraduate bodies, various student welfare boards or committees.

The buildings and grounds department, which might be termed "the housekeeper of the physical plant."

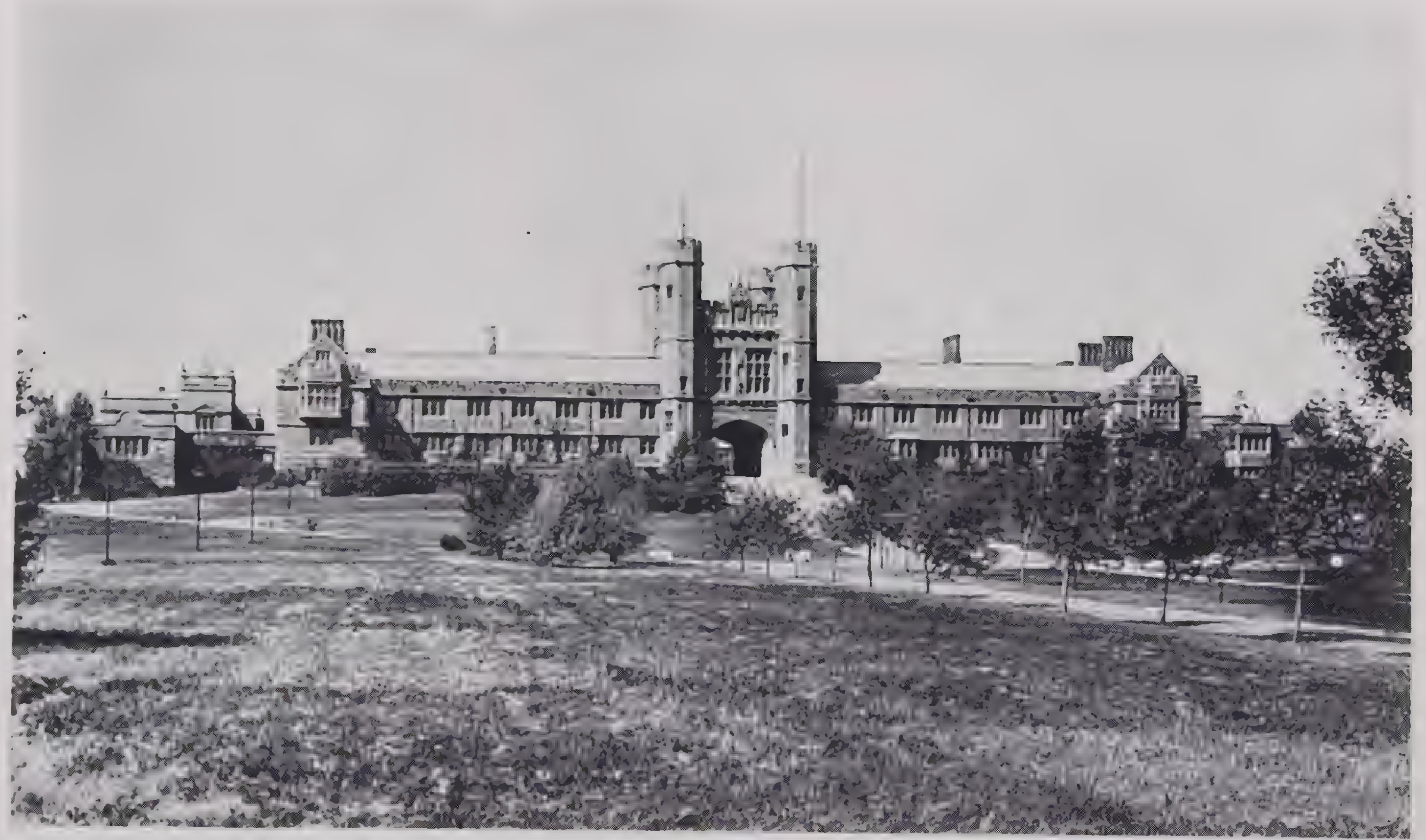
Academic administration has usually found itself well settled in the main—and often the oldest—academic building, as, for example, University Hall at Harvard, Nassau at Princeton, University Hall at Michigan, Bascom at Wisconsin, University Hall at Northwestern. In some cases, where there is room for it, the business administration is also housed in the main academic building, but the subsidiary boards are more often found there, probably for reasons in which sentiment plays a part. The buildings and grounds department is in most cases located beside the central heating and mechanical plant, where also the supplies are received and stored until distributed.

Whether to group two or all these departments under one roof each institution will decide for itself. One president was heard to exclaim that he was through with being housed in any academic building; he wanted one of his own. He meant an administration building and he would welcome in it all the departments above named.

The location of such a building is oftentimes too accidental to be in a proper proportion to its purposes. One so situated that the visitor must perforce approach it when entering the grounds by the gateway he must inevitably use would be the ideal, so far as this building alone is concerned. But not always is the point of entrance so effectively expressed as at Washington University, with its archway and towers commanding a terminus of Lindell Boulevard, St. Louis. Usually our universities have open boundaries giving entrance equally from all



LIBERAL ARTS BUILDING. UNIVERSITY OF COLORADO



UNIVERSITY HALL (ADMINISTRATION), WASHINGTON UNIVERSITY, ST. LOUIS. COPE & STEWARDSON, ARCHITECTS sides. If they were enclosed like an army base,—even as a private estate is enclosed by hedge or fence,—a position immediately inside the entrance would distinguish the administrative centre as it would the commandant's office in one case, the gate-keeper's lodge in the other. In these examples, however, *control* of the domain is implied, and we are speaking of too hospitable a world to be either governed or immured in such arbitrary fashion. It would mean a degree of orderliness exceeding the demands of the situation to align an entire group of college buildings behind an administration building comparatively insignificant in size, as it would be if devoted to this purpose alone. More would be lost than would be gained. And yet we read with satisfaction that architects are striving with this very problem of locating the centre of administration.

"Another beautifully characteristic work in Los Angeles is at Occidental College, by Myron Hunt, architect," writes Mr. John Galen Howard, an architect of San Francisco.[1] "As almost everywhere else, administration occupies at present only a comparatively small part of one of the classroom buildings. The plan is eventually to erect an administration building at the head of the main axis of the composition, a fine dominating position raised well above the level of the rest of the group."

At some of the old institutions we find administration housed in a structure neighboring closely the initial historic buildings, as, for example, at the University of Delaware and at Washington and Lee University. Newcomb Hall (1882) at Lexington, Va., contains not only administrative offices but the department of economics, political science and commerce with its special library and lecture rooms, and it conforms in style, and is intimately connected with, the historic "Washington College" (see illustration, p. 12). Within the severe cubical outlines of Massachusetts Hall (1802), the oldest building at Bowdoin, are housed administration on the first floor and a museum of mineralogy on the second and third.

The inception of a college was commonly marked by the erection of two buildings, one providing for the instruction of students and the other their lodging. The former was sometimes naïvely termed the "education building." Its interior was divided into a number of rooms of approximately equal size. One or two served as administrative offices, others as classrooms; one might have been the library, another a primitive laboratory. Even an assembly room might have been unnecessary, since the number of students was small. For worship the village church sufficed.

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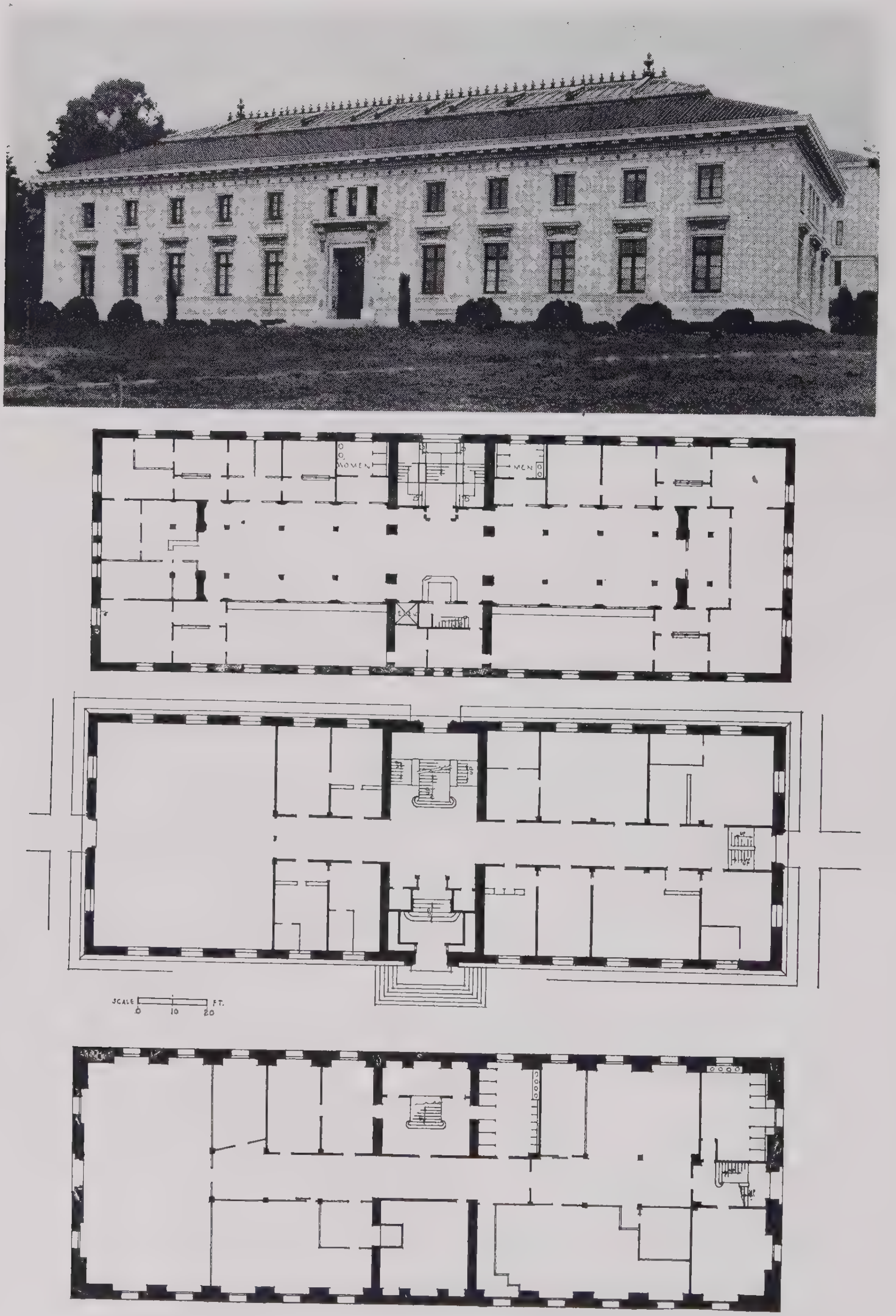
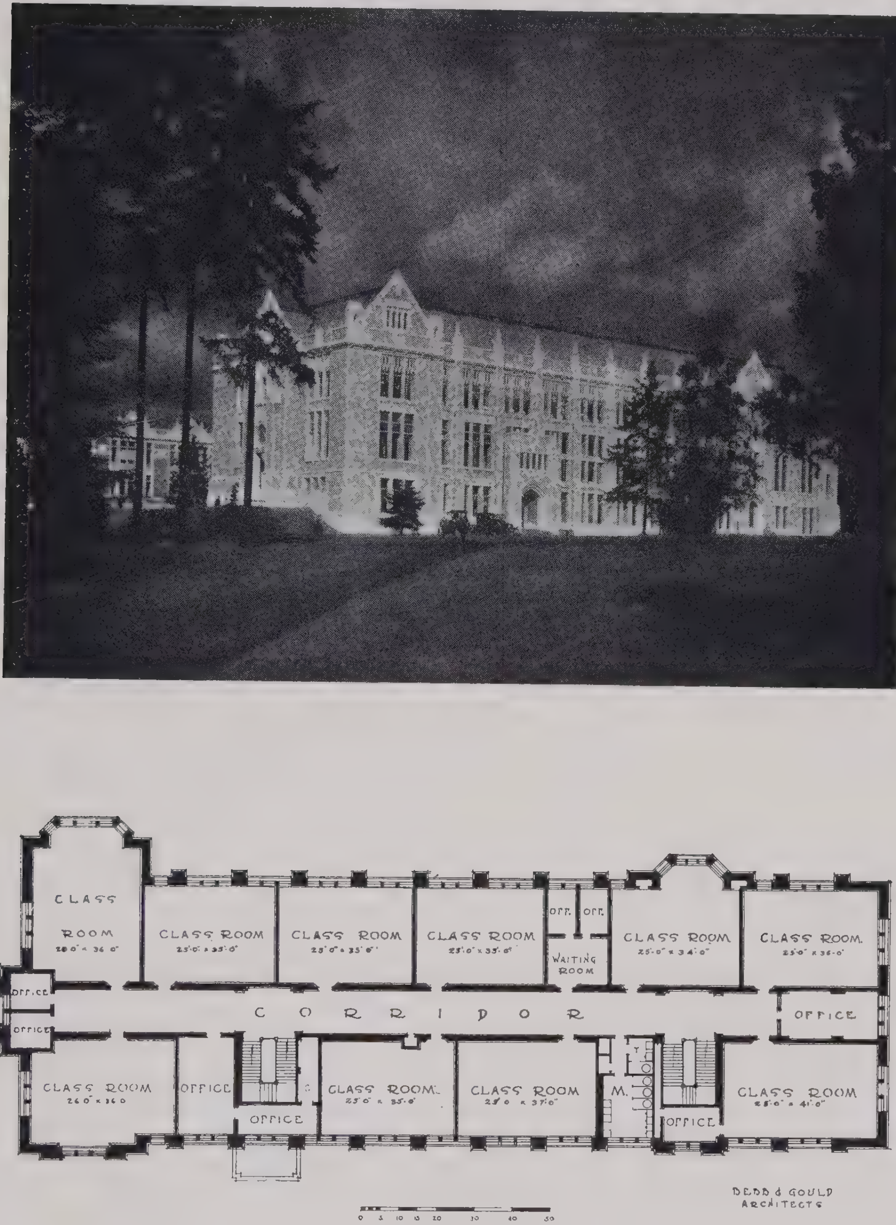
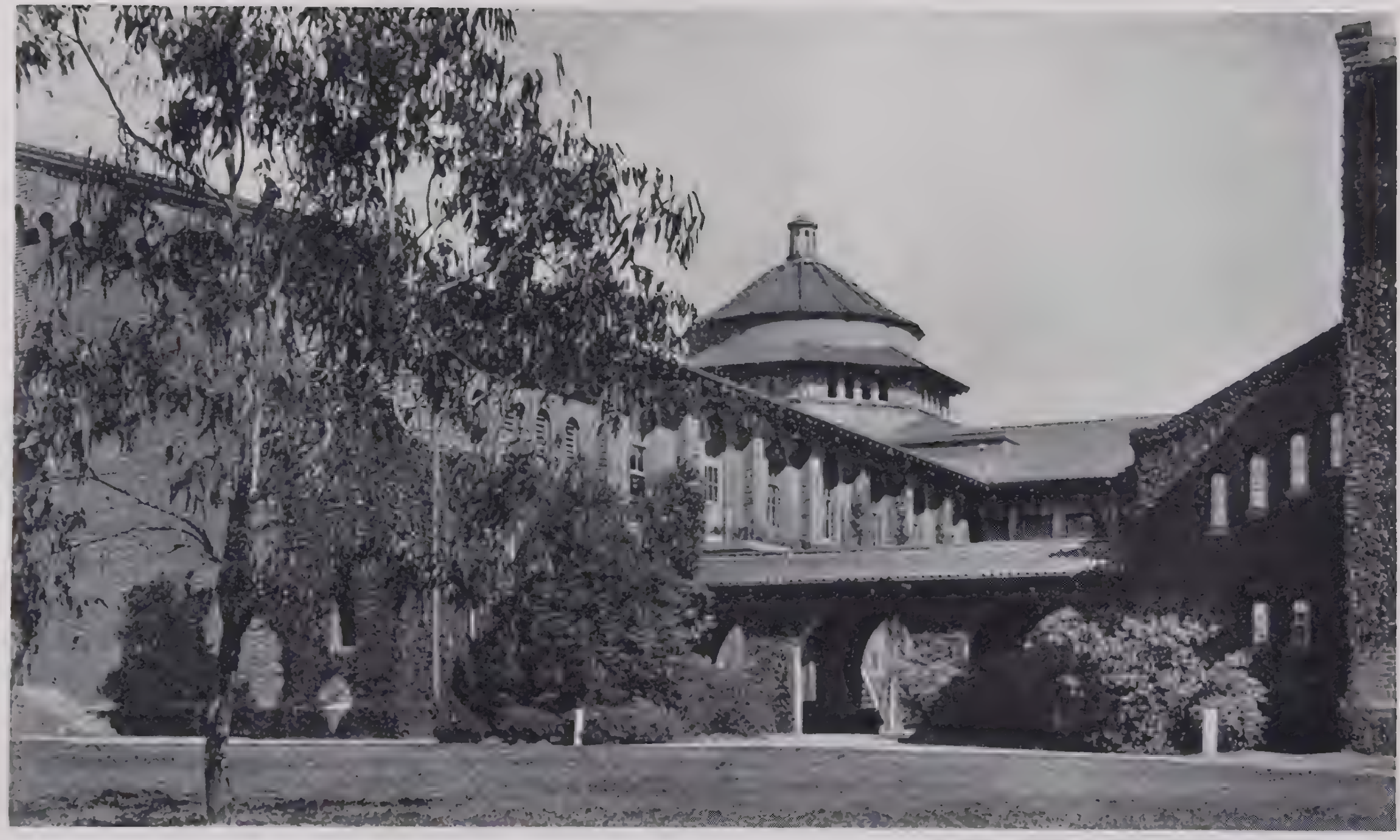
[1] *The Architectural Forum*, June, 1926.



CALIFORNIA HALL AT BERKELEY, WITH BASEMENT, FIRST AND SECOND FLOOR PLANS.
JOHN GALEN HOWARD, ARCHITECT



EDUCATION HALL (CONTAINING ADMINISTRATION) AT THE UNIVERSITY OF WASHINGTON, SEATTLE. BEBB & GOULD, ARCHITECTS



MILLSPAUGH HALL, UNIVERSITY OF CALIFORNIA, SOUTHERN BRANCH. ALLISON & ALLISON, ARCHITECTS

Following the course of progress until recent times it is found that at large institutions there remains no building with the varied function we have described. If the original education building or its counterpart remains, it is only as an architectural unit. As the colleges grew the education building grew apace in size and elaboration. An assembly room, perhaps a museum, and a small library were included. With continued expansion, however, the building with so diverse a function became specialized. For the teaching of science another building was especially provided, and other branches of instruction requiring special architectural facilities profited by the interest of donors or the demands of the student body. As enrolment increased a building for assemblage became conspicuous upon the campus. Similarly, the library was given a home of its own, and at a later stage of organization a museum building and structures especially devoted to the study of music and the graphic arts were erected. The purposes the original building continue to serve were those of academic administration and probably the teaching of the liberal arts.

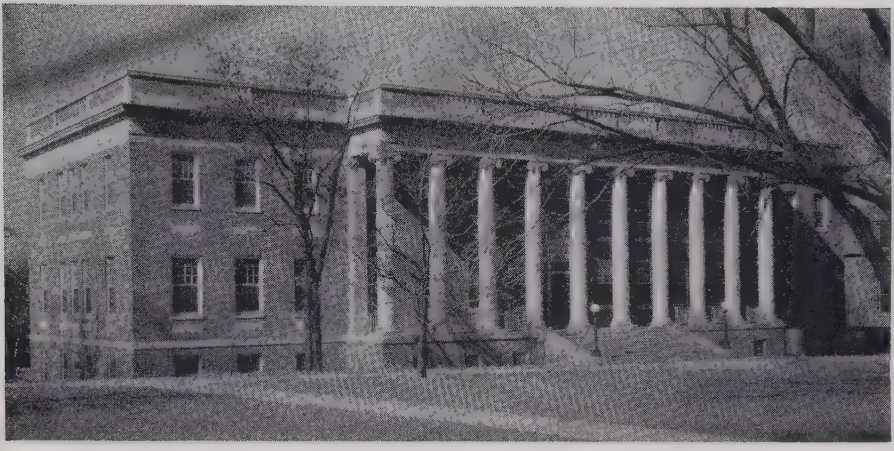
Inasmuch as the number of institutions having an entire building devoted to administration is small, it will be of interest to examine a few examples of the many buildings that combine administration with instruction and to notice the tendency of either the first or second to crowd the other out with the prospect of claiming ultimately all the building for its own. Increase of enrolment of itself causes administration to make demands for greater space. At Berkeley, Calif., we are told enrolment has long ago grown so beyond all calculation that the operation of large bodies of students standing in line for registration, payment of fees and the like is held in the open air. In case of rain the Men's Gymnasium is the only covered space large enough to serve upward of 10,000 students congregated for this purpose.

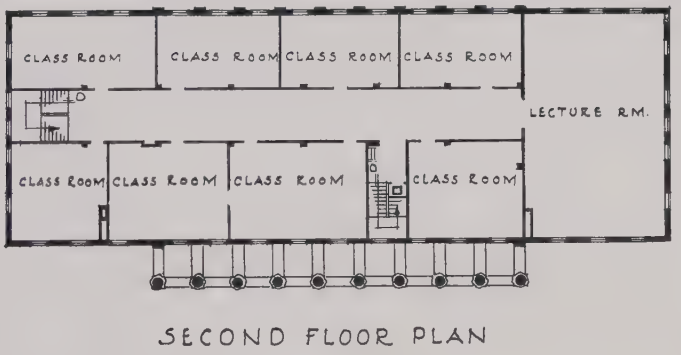
The case of California Hall at Berkeley is typical. It was the first building completed of the Phœbe A. Hearst Development Plan, and its designer, Mr. John G. Howard, tells us it was planned "on a programme about equally divided between administration and instruction, the first story originally containing only classrooms and the second story only administration. Since 1905, when the building was first occupied, the enrolment of the University has so increased, and with it the needs of the administration, and at the same time instruction has been so far taken care of in other newer buildings, that all of California Hall has been given over to administration except one large lecture room on the ground floor. And several departments of administration are provided for elsewhere."

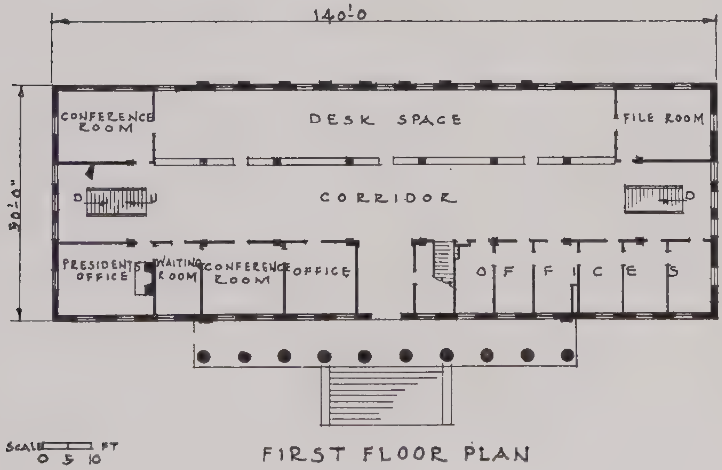
The administration of the University of Washington now occupies the ground floor and a part of the mezzanine floor of Education Hall, and classrooms occupy the remainder of the building. Eventually the lower floors will be remodelled into classrooms and the administration will occupy a building entirely to itself already designated in the development plan produced for that institution by architects Messrs. Bebb & Gould.

At Reed College administration shares with library and classes the main building designed by Mr. A. E. Doyle. Similarly at Tulane University the dominating building, Gibson Hall, fronting St. Charles Avenue, the main approach to the institution, contains the administration as well as many rooms for instruction and student activities. The fine modern main building at the H. Sophie Newcomb Memorial College is known as the "Administration Building" and is officially described as the one "in which the exercises of the College are mainly conducted." It contains the various laboratories and classrooms for

ADMINISTRATION BUILDING, UNIVERSITY OF MINNESOTA.
CLARENCE H. JOHNSTON, ARCHITECT







ADMINISTRATION BUILDING AT THE GEORGE PEABODY COLLEGE FOR TEACHERS.
McKIM, MEAD & WHITE, ARCHITECTS

academic work as well as the office of administration, the library and the assembly hall.

At the College of Puget Sound the divided occupancy of Jones Hall by administration and teaching is found satisfactory because of the small enrolment. The Administration Building, designed by W. C. Knighton, at the University of Oregon has the basement and ground floor given over to various academic uses while the administrative offices have the entire second floor. The administration building of the Southern Branch of the University of California[1] also contains the chief auditorium and other departments of instruction. It is, in fact, an administration building only in name, and is sometimes otherwise known as Millspaugh Hall. It is the largest and dominating building of the group thus far constructed at Los Angeles. Near the entrance are the offices of the president and his secretary and beside them a single room for the business office with an adjoining reception room serving all of these. There are four rooms for the faculty, rooms for a faculty secretary, an appointment secretary and there is also a record room. Two courts are enclosed in the plan of this interesting building. Between them is the auditorium, 70 x 104 feet with a seating capacity of 1,600. The remainder of the two stories is occupied by twenty-five classrooms for academic teaching and two lecture rooms each 34 x 48 feet.

At Stanford University administration "occupies the centre of the left half of the Quadrangle front." This conspicuous centre of the architectural façade would be an easily discernible place for the administrative headquarters were it not for the presence of another "centre" exactly like the first marking the middle of the *right* half of the Quadrangle front. It is to be supposed that a tablet or lettered sign designates the offices.

At the State University of Louisiana progress has been made at giving administration offices a logical and readily apprehended position. A wide thoroughfare leading out from Baton Rouge reaches the University beside a rectangular plaza in the centre of which is the Soldiers and Sailors Memorial Building of commanding height and surmounted by a dome. Upon each side of the plaza is a one-story structure 46 feet 6 inches by 86 feet occupied by administration and known as the "North" and the "South" Buildings. The former contains offices of the President, Registrar, Dean of Women, the Alumni Secretary and a large room for the registration staff and records. The interior of the latter is divided into a post office and bookstore, offices for the military department and space for the reception of mail and express ship-

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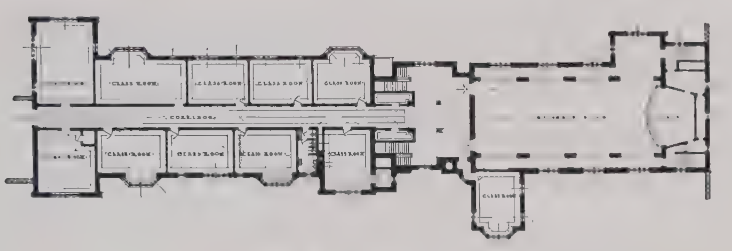
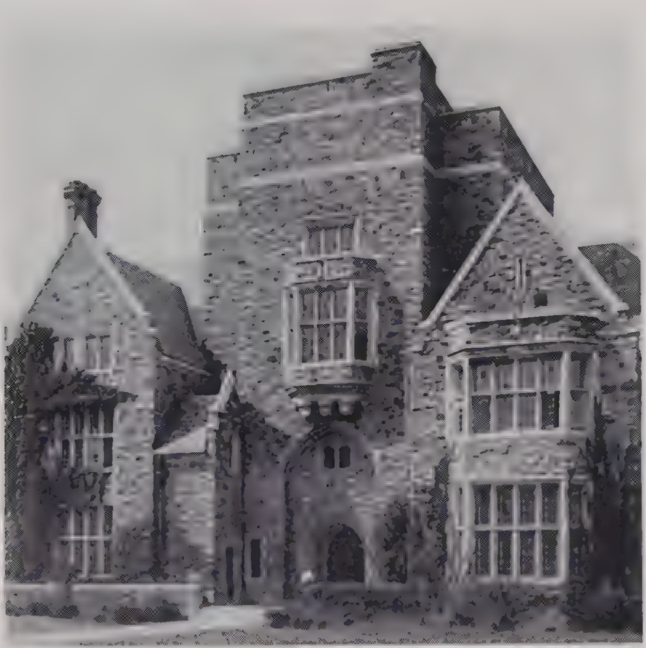
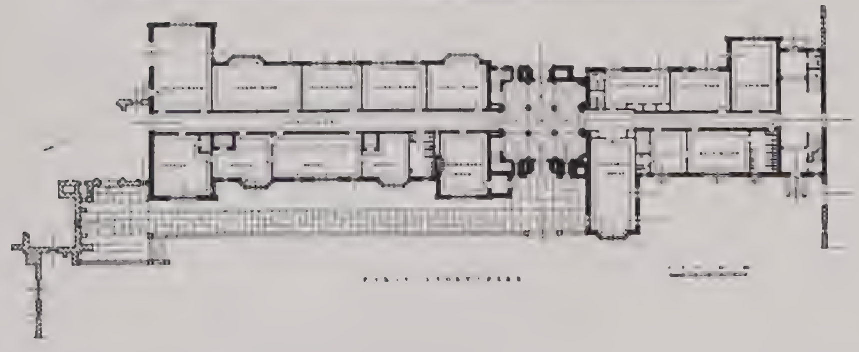
[1] Originally erected for the Los Angeles State Normal School.



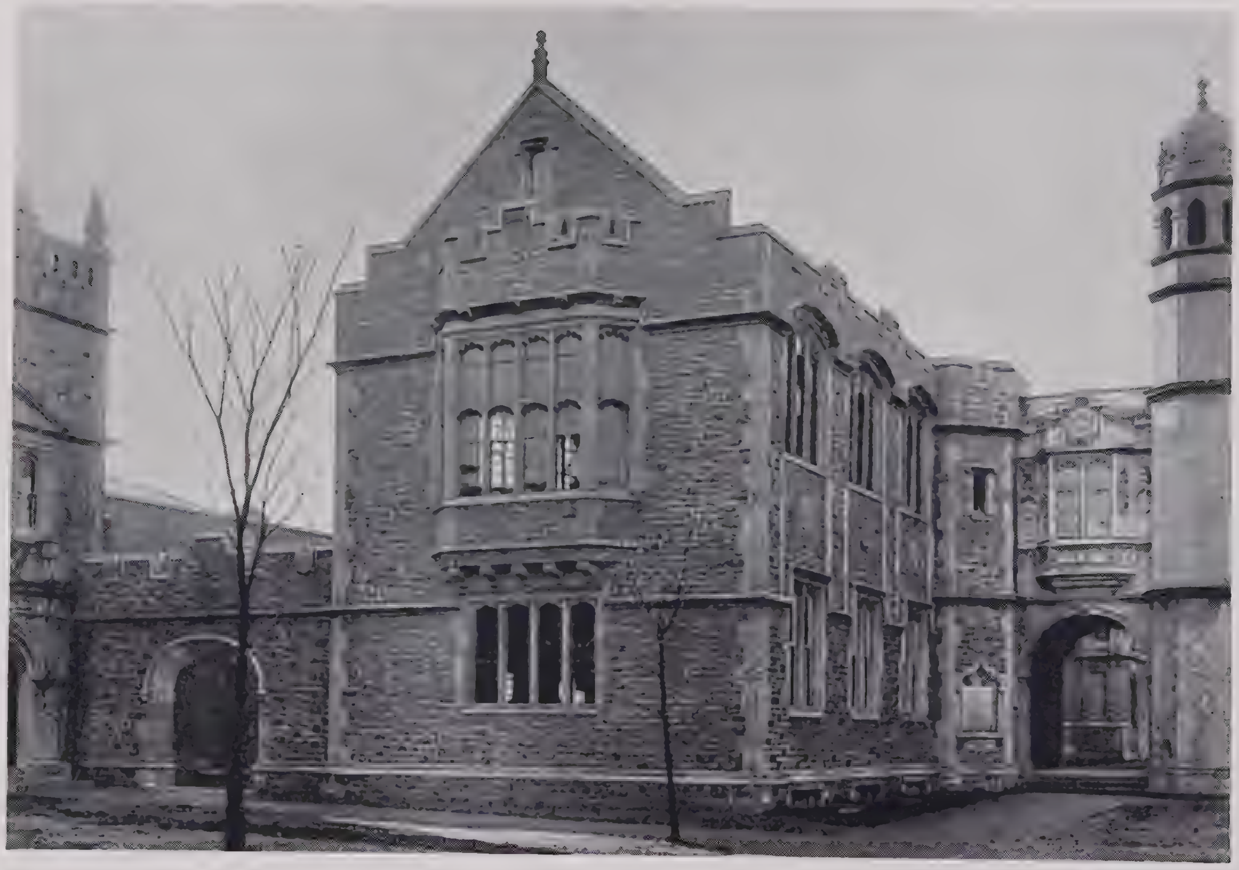
SECOND STORY PLAN





FIRST STORY PLAN

PALMER HALL, ADMINISTRATION AND ACADEMIC BUILDING AT SOUTHWESTERN UNIVERSITY. HENRY C. HIBBS, ARCHITECT



JANUARY HALL OF LAW, WASHINGTON UNIVERSITY, ST. LOUIS. JAMIESON & SPEARL, ARCHITECTS ments. It is conceivable that such a dual arrangement might divide itself into scholastic administration on one hand and business or plant management on the other. These buildings are the nearest to the visitor of any of this large group as he arrives at a place which any scrutiny of the plan would reveal as the logical point of approach. This is interesting as showing what can be done to identify the administrative centre when designing an entire new group of college buildings, for it is inconceivable that such a group should not have one point of entrance the most frequently used by visitors.

The University of Minnesota is fortunate in having a modern building housing all administrative departments and representing a unit of the fine development plan devised by Mr. Cass Gilbert. Parkhurst Hall at Dartmouth houses all the administrative offices of the college. Ohio State University has an administration building without classrooms. Upon a smaller scale is the delightful building at Oberlin, devoted solely to administration and providing satisfactory working space for a staff of twenty-five to thirty persons. Northwestern's little building, wholly occupied by business offices at Evanston, is a model of its kind.

The Administration Building designed by McKim, Mead & White for the George Peabody College for Teachers at Nashville has the broad longitudinal corridor intersected midway of its length by a short one. The first floor contains the offices upon either side of the corridor and the second floor is occupied by eight classrooms and a lecture room. This arrangement makes for convenience upon all counts. The offices are easy of access and the classrooms are withdrawn from the coming and going of people—sometimes in large numbers—having business to transact below.

The entire centre portion of the ground floor in the Alumni Memorial Administration Building at Lehigh is a memorial hall. A corridor paralleling it leads to two terminal wings, one containing the administrative offices, the other entirely occupied by an assembly room.

If a structure is to be designed for the sole purpose of housing administration, the problem for the architect would be to discover and to develop a character that would distinguish the structure by some other means than a sign affixed to its exterior. The difficulty is that administration requires only a series of offices, and these cannot of themselves endow with any distinction the building containing them.

Listed below are the rooms which should be provided in a complete building designed to house administration alone. This may serve as a programme or guide to the architect, though it would in most cases be capable of curtailment.

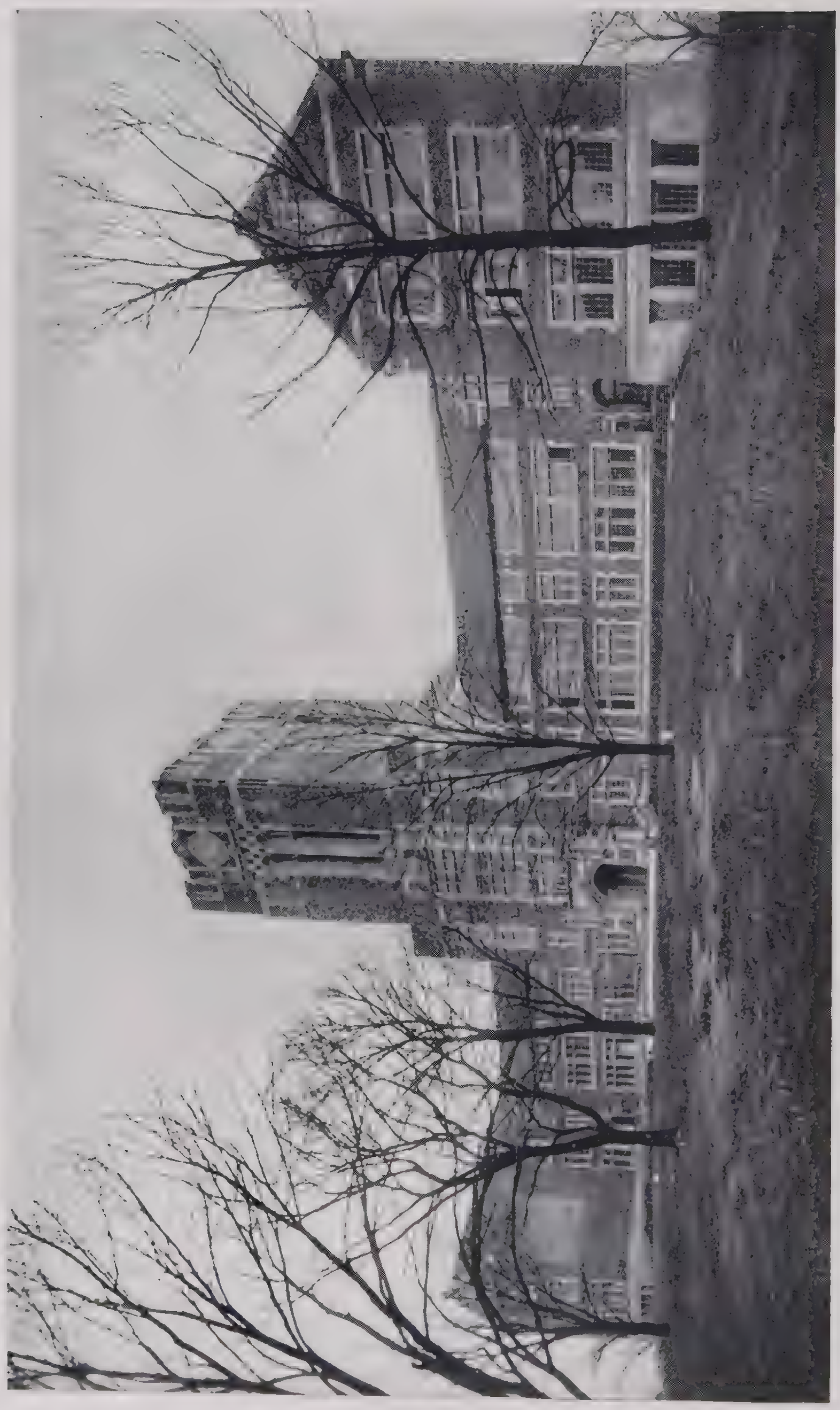
ALUMNI MEMORIAL ADMINISTRATION BUILDING AT LEHIGH.
THEODORE VISSCHER AND JAMES BURLEY, ARCHITECTS

President's Reception Room.
President's Office.
A room or rooms for his secretaries.
Office of the Dean of the University.
A room for his secretary.
Comptroller's Office.
Vice-President's Office.
Secretary's Office.
Office of Deans of the separate schools.
Graduate Division Offices.
Office of the Dean of Women, unless the institution has a separate organization and group of buildings devoted to women.
Faculty Room for Conferences.
Faculty Room for Records.
Registrar's, Recorder's and Examiner's Offices.
Board of Trustees (or Regents) Room.
Committee Room.
Faculty Assembly Room.
Business Manager's or Bursar's Office and Clerks.

Offices of the Accounting Department and File Room.
Vault.
Offices of the Purchasing or Bursar's Department.
Department of Buildings and Grounds.
Office of the Vocational Secretary.
And in addition any other room or rooms, if any, which may be specially required by the institution. At women's colleges spacious parlors, sometimes in the dormitories, are at the disposal of parents wishing to see their daughters. At men's colleges parlors in dormitories are not so generally provided and it would seem, therefore, that there should be parlors for this purpose in the administration building.

The relative positions of each of these rooms to the others will be finally determined by the officers who are to occupy them. Wide hallways are necessary, nor should it be forgotten that there must be a spacious lobby or central hall on the ground floor. The ceilings may be of average height and the windows of average size and frequency, but variety may be obtained for the exterior by devoting a central portion or wing to the assembly room for the faculty. Such a room would necessarily have a higher or curved ceiling and a different

HOME ECONOMICS BUILDING AT WISCONSIN.
ARTHUR PEABODY, ARCHITECT; PAUL P. CRET, CONSULTING ARCHITECT



AYRES HALL, UNIVERSITY OF TENNESSEE. MILLER, FULLENWIDER & DOWLING, ARCHITECTS fenestration from that of the remainder of the building. In fact, most architects would seize upon it to make it the dominating element in the design.

Academic Buildings

Our theme now merges into buildings devoted entirely to academic purposes. These should be so planned that an increase in size will be feasible within the limits set by the development plan for the mass of the building circumscribed by the site. A point of departure is the size of the classes.[1] In this respect there is a marked difference between institutions. Those in the East conduct their work with smaller classes than the great state universities of the Middle West. In planning Angell Hall at Michigan, it was observed that the academic buildings inspected elsewhere had little or no provision for variety in the size of classes and especially for some of the large classes held at Michigan. The longitudinal central hall was, therefore, offset from the centre at each end of the building to provide a study room at one end and a classroom at the other, each seating 248 students.

Generally speaking, classrooms should occupy the north side of the building, if possible, and the faculty offices the southern. The width of the corridors should be proportioned to the daily population of the building and additional space provided within the main entrance or at the crossing of corridors for students to congregate during the intervals between classes. The programme which the faculty, through the chairman of the building committee, should give the architect will probably call for the greatest number of classrooms that can be had within the extent of the building and for the money appropriated, and after providing a lecture room or two, offices for the professors, a study room, a room or two for small special classes and a few seminars. All the large classrooms should be on the first floor with a view to confining the greatest number of students to that floor and reducing traffic through the building. If the subjects taught constitute a distinct department of a college or a college of a university, the offices of the department, including that of the dean, should be included in the plan by giving them a convenient position preferably on the first floor beside the entrance; otherwise on the second floor facing the main stairway.

The main longitudinal corridors will range from 10 to 14 feet in clear width. It is desirable that they have straight flush sides free of

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[1] The University of Minnesota has been carrying on a study of the size of classes with regard to the effect of large and small classes upon the students, but the findings of this investigation have not yet been published.

FOUNDERS HALL (LIBERAL ARTS), WELLESLEY

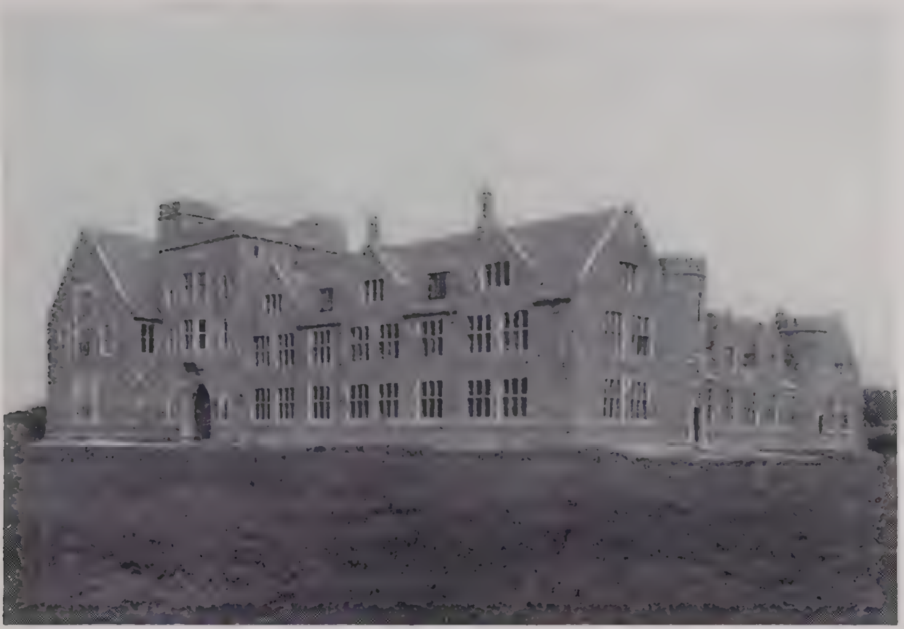
exposed columns or other projections. If double longitudinal partitions confine the corridor on each side, they will also enclose the longitudinal rows of internal structural columns. By placing the doors flush with the rooms instead of flush with the corridor the very desirable end is attained of freeing the corridors from the repetition of discordant dark color notes of doors and their trim. Taking the "plan area" at 100 per cent, *i. e.*, the area of the first floor plan within the periphery of the building as represented by the outside surface of the external walls, it has been found from an analysis of a number of academic buildings that the net usable floor space of rooms is about 65 per cent, of circulation (corridors, lobbies and stairways) 19 per cent, and the remainder 16 per cent, representing the tare of closets, toilet rooms, walls and partitions. Whether the basement may be turned to account for teaching purposes depends upon the distance of its floor below the exterior grade, the nature of the soil and the natural lighting. If the elevation of the ground is so little above water level that waterproofing of the basement would be necessary, it may be decided to abandon the attempt to make it a usable story. Moreover, if the architectural conception of the group of buildings disposed around the campus calls for each structure to be set low, its first floor can only be placed two or three feet above the campus level, and this means that at least the campus front of the basement must be given up to storage purposes. In most cases the best architectural effect is obtained by this arrangement, and it should not be objected to, especially if the architect is willing to have areas at the ends or rear of the building giving full air and light to the remaining portions of the basement. Sometimes the fall of the land will permit the entire basement on the side of the building away from the campus to be made a full story for classrooms or any other purpose desired.

The terms "classroom" and "lecture room" appear to be not very radically distinguished. An observer of Eastern institutions would conclude that when the seats are less than 30 in number the room is designated a "classroom" and when they exceed this it is a "lecture room." In the West the number above given should probably be trebled. Nor is there any rule about the sloping of floors. The teacher's demonstration being made, as it is in academic buildings, upon the blackboard, would point to little need to elevate the rear seats. The 248-student classroom at Michigan above mentioned has a level floor and yet there is many a small classroom for blackboard demonstration with sloping tiers of seats. The maximum depth of a classroom or lecture room is determined by the distance from which pupils with normal eyesight seated in the rear row can read what is placed on the blackboard. In certain states the laws require that two doors shall be provided even the smallest of classrooms to give more than one means of egress in case of emergency.

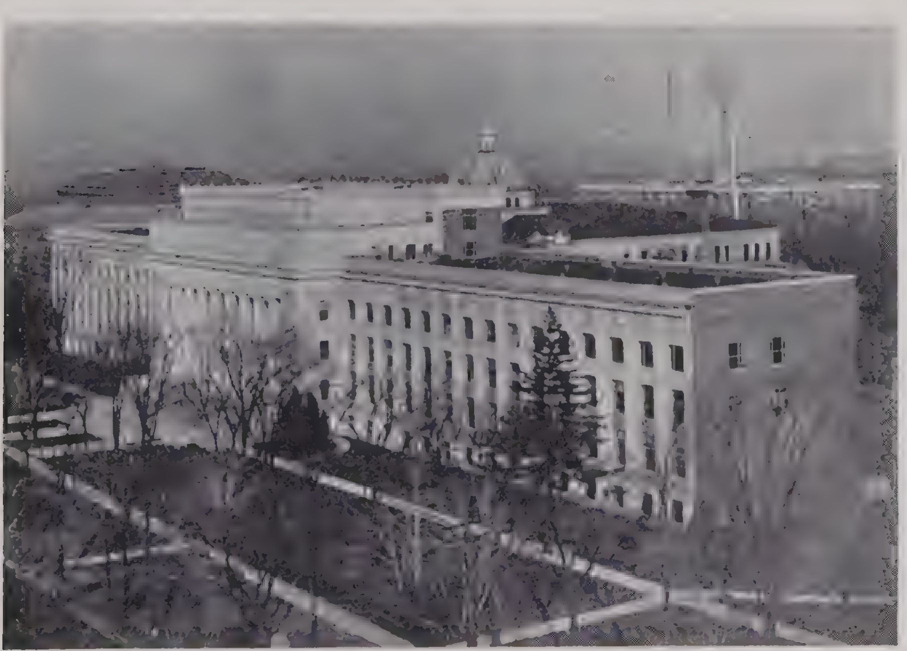
Seats should be so arranged that the light will fall on them from the left; if this is not possible, from behind. Individual seats bolted to the floor take up the most space. In some of the new buildings wood benches are seen, each seating six students. In the lecture rooms of the fine new Mayer Law Building of Northwestern are found fixed benches and desks specially designed to seat one or two students. Lights should be hung from the ceiling and so shaded as to throw the light toward the front of the room. An essential detail is to glaze classroom doors with glass so nearly transparent as to permit a person in the hall to see if the room is occupied without opening the door. The intolerable distraction of the frequent and momentary opening of classroom doors can easily be avoided in this way.

It is generally conceded that lockers, bookcases, museum cases or other similar objects along the sides of corridors give a very disorderly appearance to the building. If lockers are necessary,—and in purely academic buildings they are generally not,—they should be located in the basement. Sometimes they are recessed in the walls between corridors and classrooms and the layman is apt to think this a perfect solution. But those familiar with building technic know that the space thus occupied is very valuable for containing the many ducts necessary for heating and ventilating. Exhibition cases should be in rooms or lobbies specially devoted to them.

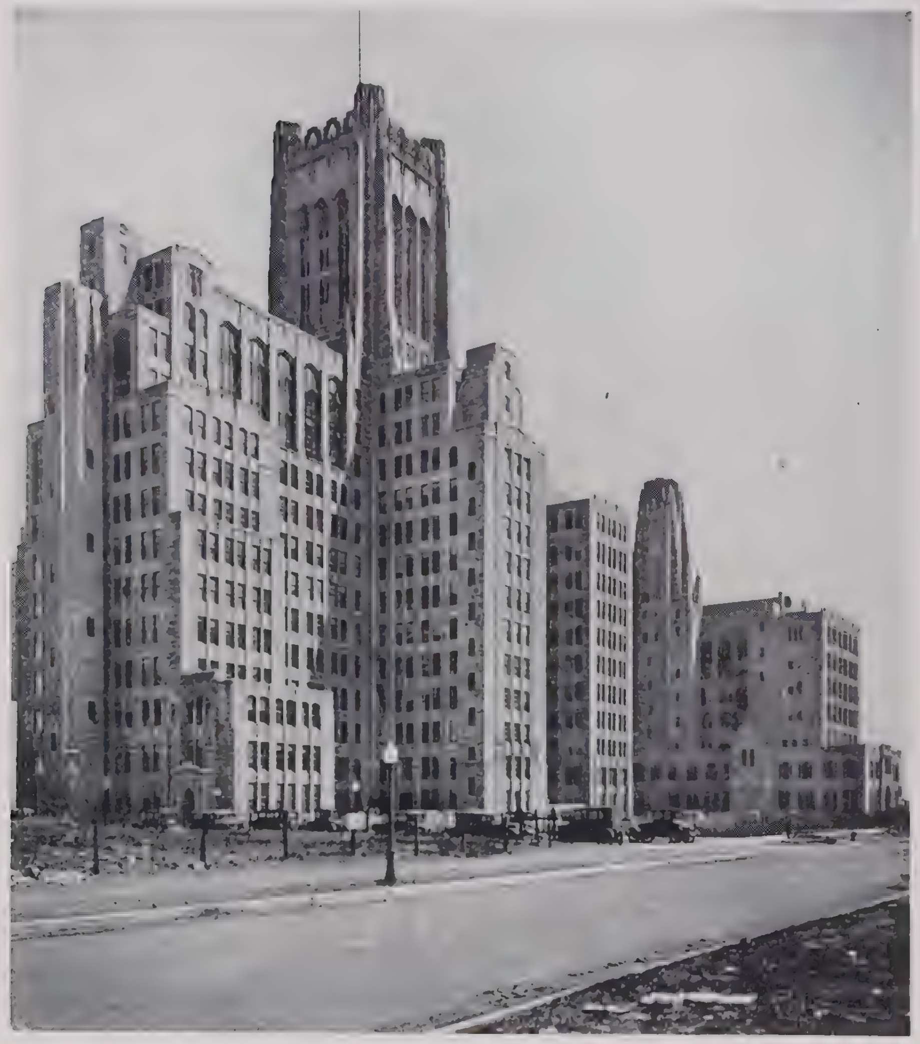
There are sinister forces to-day militating against the designing of fine academic buildings for colleges and universities. It has been said that these buildings are teaching workshops, but little removed in their function and incapable of being widely distinguished architecturally from laboratories where teaching is supplemented by the manipulation of objects and materials. This point of view is too often carried to extreme by faculties who add the argument of making every dollar spent go the farthest to provide the utmost teaching space. But there is yet another force with which the architect must contend in aspiring to make of his building a monument of fine and lasting architectural quality. This is the arbitrary and ever stricter requirements of building codes applying indiscriminately to all buildings where any teaching is carried on. In many states the building code for public schools is held to apply without the slightest modification to college buildings. Especially insistent are bureaucratic officers upon the subject of window area and exits. These influences, added to modern forms of fireproof construction, are resulting in a type of academic building that



THE BLODGETT HALL OF EUTHENICS, VASSAR. YORK & SAWYER, ARCHITECTS

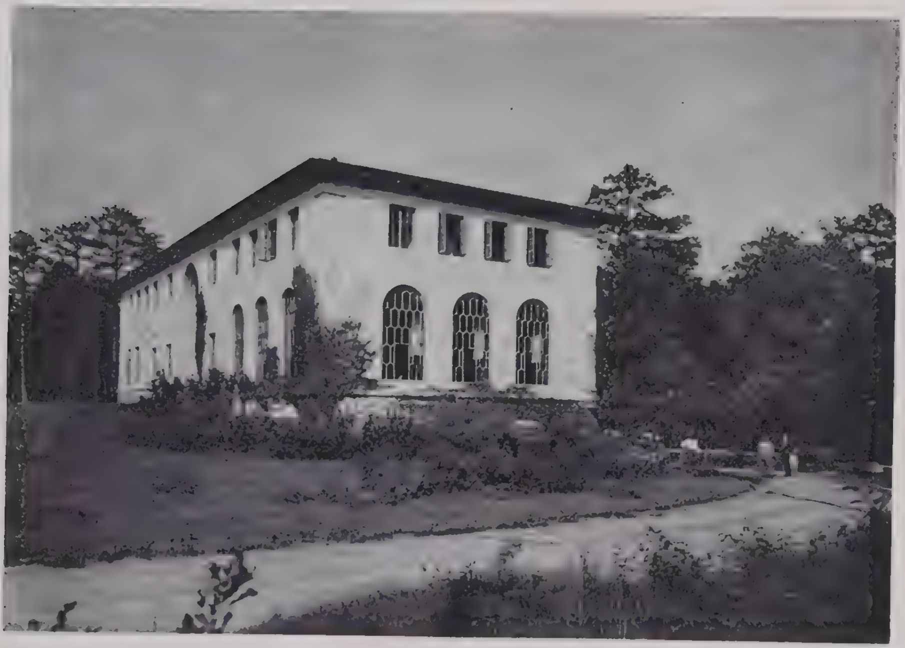


ANGELL HALL, UNIVERSITY OF MICHIGAN. ALBERT KAHN, ARCHITECT



MONTGOMERY WARD MEMORIAL BUILDING AND WIEBOLDT HALL (SCHOOL OF COMMERCE), NORTHWESTERN UNIVERSITY, McKINLOCK CAMPUS.
JAMES GAMBLE ROGERS AND CHILDS & SMITH, ARCHITECTS

bids fair to become uniform throughout the land. We have seen factories more pleasing architecturally than some of these teaching buildings "vertically striped" by solid piers monotonously alternating with vertical rows of windows. These new structures of an over-practical type are a far cry from the old and now obsolete buildings, with their small—often round-headed—windows, in which much knowledge was imparted to students and who were not however made blind by the process. We are not defending all the old structures nor condemning all the new,—but we urge the utmost encouragement to be given an architect who is striving to endow his building with some distinctive character and happy individuality, even though extreme pedagogical and hygienic opinions may have to be curbed thereby. It is only in this way that monotony and mechanical conformity, earlier deplored in this volume, can be avoided.



LAW SCHOOL, EMORY UNIVERSITY. HENRY HORNBOSTEL, ARCHITECT

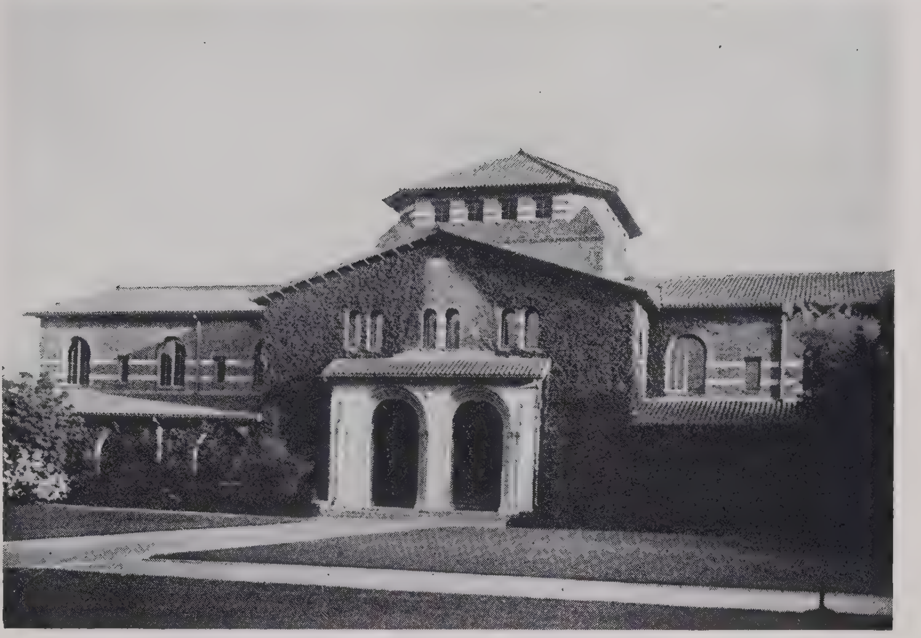
CHAPTER V

LIBRARIES

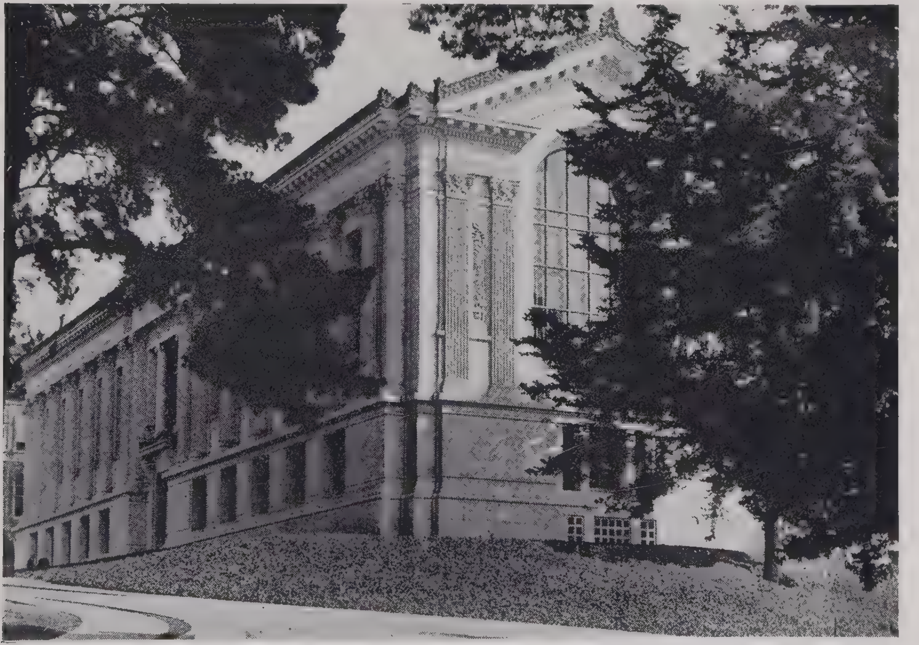
The library is the intellectual central power plant of the college or university. It is related to all departments and it must keep pace with all departments in supplying to each branch of study the books and references needed. Hence the library must be sensitive to the expansion of any teaching unit of the institution. If a new department is added, there must be a corresponding increase in the library's volumes; and this means, if there is not space for the addition of new stacks within the original building, an increase in the size of the structure itself. Thus it is seen that the comparison of the library with the central heating plant is not merely figurative, for the heating plant must increase its service as soon as a new building with its additional "load" is erected. Quite apart from accessions as above indicated, librarians point out that increase in the number of volumes of a library is inevitable and continuous, that book collections grow whether the student body does or not. Buildings erected as enduring monuments at some of the larger institutions have soon been found so inadequate that drastic remedies must be applied, and it would be easy to point to a number of conspicuous library buildings erected from fifteen to twenty-five years ago which it is already proposed to rebuild.

In planning a college or university library it would be a mistake not to study examples of successfully designed public libraries or to ignore the excellent handbooks on library planning and the data compiled and offered by the American Library Association and the Carnegie Corporation. But it must soon be realized, as the college librarian will not hesitate to point out, that the problems of the public library differ essentially from those of the institutional library. In the former the emphasis is upon *circulation:* in the latter upon *study.* The character of the books, the character of the persons using the library (requiring less oversight), the additional space per reader needed at the tables,—study requiring more table space than mere reading,—the open shelf demands and the need of segregating books on a given subject for students in seminar rooms or elsewhere are but a few of the conditions distinguishing a college library.

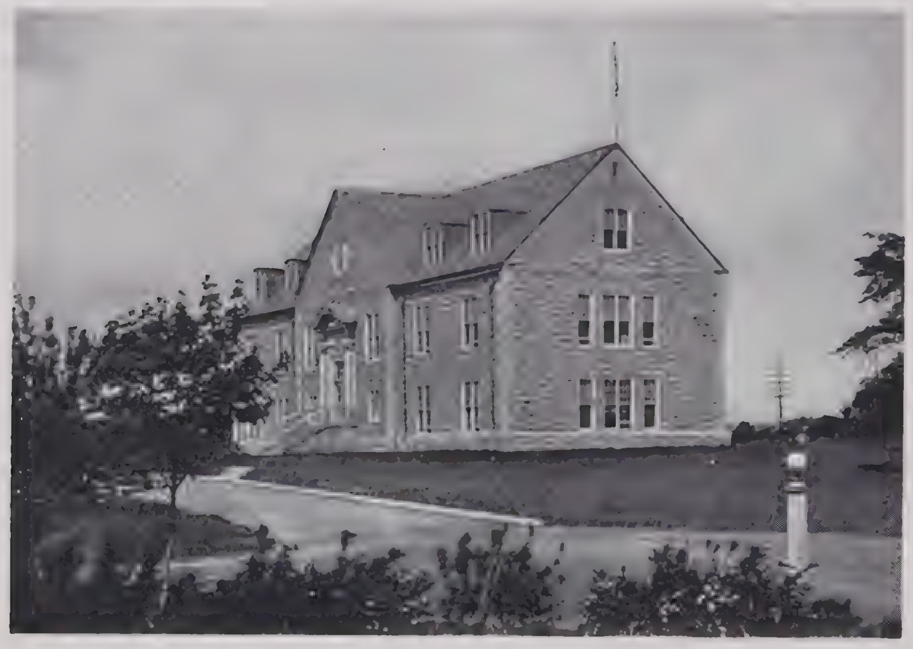
Ever present in planning a library is the problem of housing books, but even more vital is that of facilitating their use.



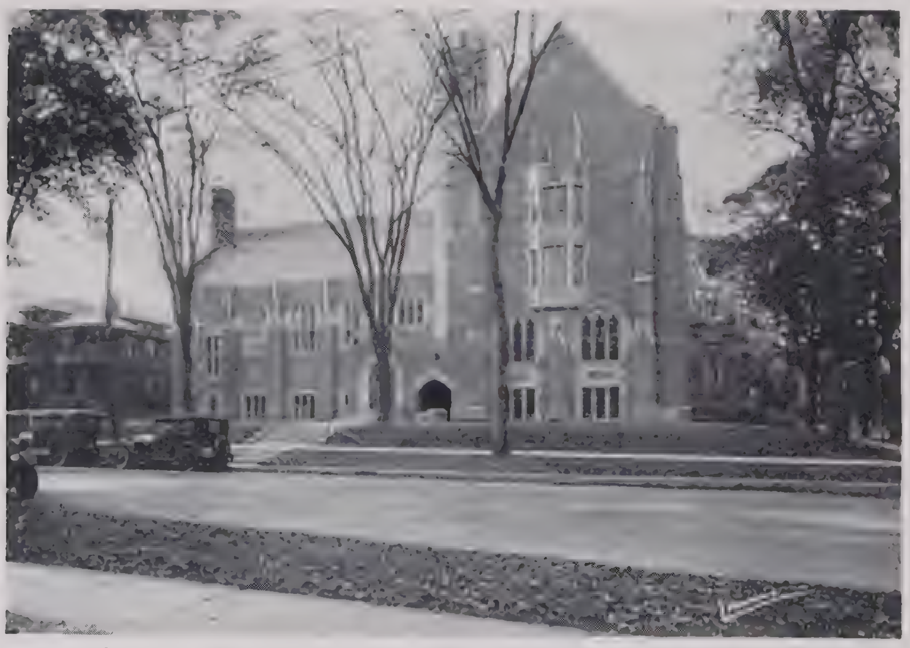
LIBRARY AT THE UNIVERSITY OF CALIFORNIA, SOUTHERN BRANCH.
ALLISON & ALLISON, ARCHITECTS



LIBRARY OF THE UNIVERSITY OF CALIFORNIA AT BERKELEY.
JOHN GALEN HOWARD, ARCHITECT



LIBRARY OF THE CONNECTICUT COLLEGE FOR WOMEN. CHARLES A. PLATT, ARCHITECT



ELMIRA'S NEW LIBRARY. COOLIDGE, SHEPLEY, BULFINCH & ABBOTT, ARCHITECTS

The eleven basic principles of planning public libraries, promulgated a few years ago by the A. L. A., are so vital and of such broad scope that they cannot but have a bearing upon institutional libraries as well, and we quote them below:

> "Every library building should be planned for the kind of work to be done, and the community to be served.
>
> "The interior arrangement should be planned before the exterior is considered.
>
> "Plans should provide for future growth and development.
>
> "A library should be carefully planned for economical administration.
>
> "Public rooms should be planned for complete supervision by the fewest possible attendants.
>
> "No convenience of arrangement should be sacrificed for architectural effect.
>
> "There should be no such decoration of reading-rooms or working-rooms as will attract sight-seers to disturb readers and attendants.
>
> "There should be good natural light in all parts of the building. Windows should extend to the ceiling, to light the upper portion of every room. In a book-room or stack, windows should be opposite the aisles.
>
> "No shelf should be placed so high as to be out of reach of a person of medium height standing on the floor.
>
> "Flights of stairs should be straight and not circular.
>
> "Communication by telephone or speaking tube should be arranged between the working-rooms."

The architect, librarian and building committee, realizing the essential differences between the needs of the public and of students, should next confine their attention to the study of institutional libraries only.

The size of the library enables it by virtue of its mass to occupy a dominating position in the group plan. The continuously expanding record of human knowledge represented by the increasing number of volumes indicates that in future libraries are likely to dominate in size every other college building. At Harvard it is officially stated that 40,000 to 60,000 new volumes are added yearly. At smaller libraries the increase is as certain and only proportionately less. Size and position of the building have another consequence, that of endowing the structure with a monumental character. Thomas Jefferson expressed his judgment in this by making the library supreme over all other buildings at the University of Virginia. Similarly did McKim, Mead & White at Columbia, and only of late years, when increased need of space within buildings has impelled an increase in their height, has the dominance of the library there been threatened. Two interior elements contribute to monumental aspect, namely the stack and the main or general reading-room, for these cannot be minimized or obscured, but rather should they be frankly revealed and made the most of in the design. There are advantages in increasing the stack vertically rather than horizontally, and this will have the effect in time of architecturally treating the stack as a tower dominating the building. These inherent qualities of the library contribute to its preponderance, and its architectural character does the rest in making it foremost of the college group. Even where there are informal styles in other buildings, architects have drifted toward a formality in the library as in no other structure. The library is the most monumental of all the buildings at California, Columbia, Harvard, Wisconsin, Chicago, Iowa State College, St. Stephen's and Bryn Mawr, and those being constructed at Yale and Dartmouth will doubtless be supreme among the buildings there, as will also the library now being designed for Princeton.

So important a function as the library serves presupposes a corresponding importance of site. This should be accessible from all buildings, but it should not necessarily be a central focus of the group plan, for that would require the library to be entered from all sides and preclude the building having a front and rear. At the latter expansion must first take place by additions to the stack unless it be increased in height. A sloping site is useful, the ground falling in leaving the front of the building, thus permitting a high basement at the rear and two stack levels, each with seminar rooms below the main floor. In the case of a library the writer has in mind, placed in the centre of a campus, both sides of the building perforce were fronts and the only place for the stack was in the basement. Expansion in this case will be exceedingly difficult.

We give below the cardinal "points for consideration in planning an institutional library building."[1]

Stack providing sufficient book storage for present and future.
Adequate seating capacity for readers.
Facilities in or near stacks giving access to the books for faculty and advanced students.

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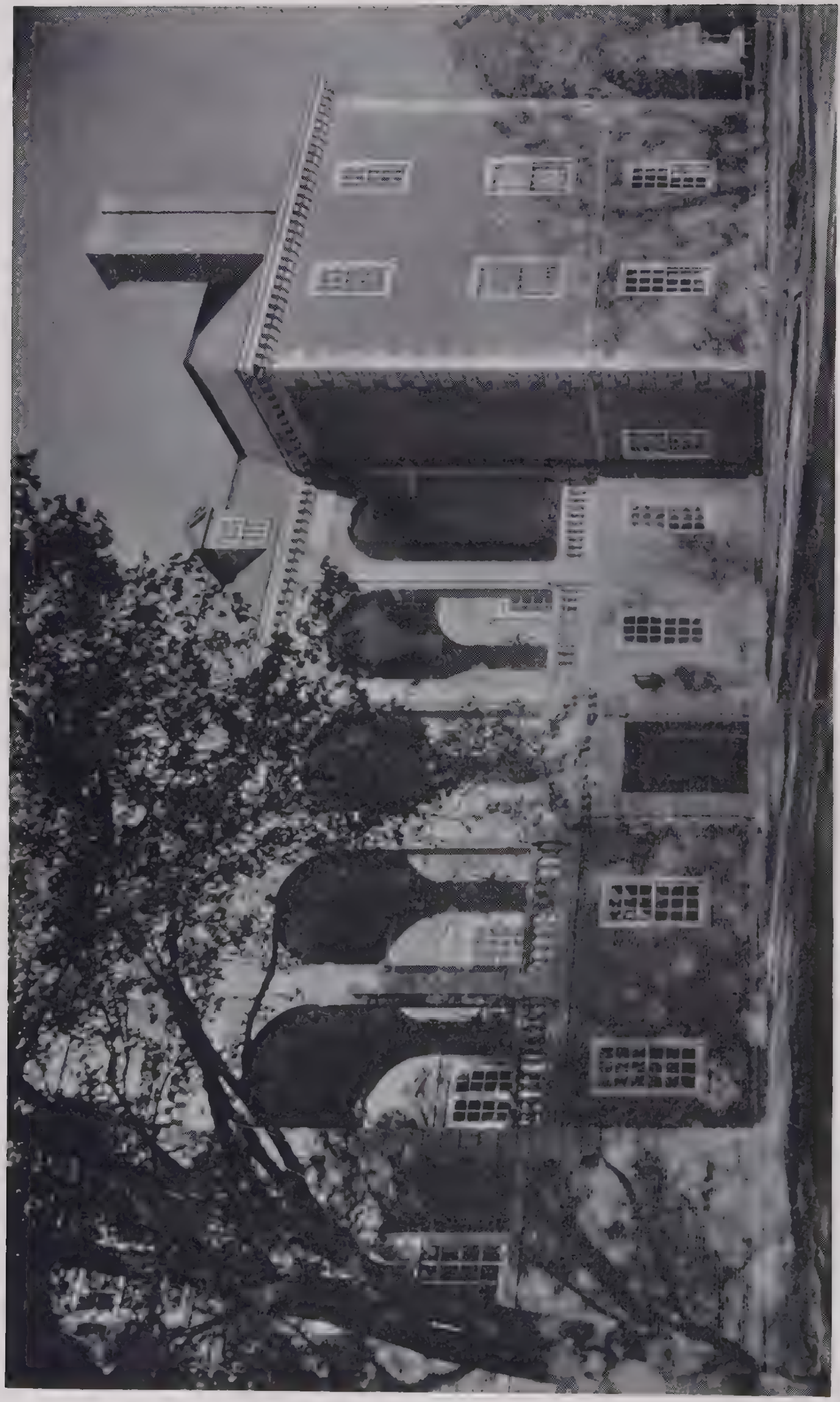
[1] Based largely on a report made to the President of Iowa State College, by Mr. P. L. Windsor of the Library of the University of Illinois, and Mr. Frank K. Walter of the Library of the University of Minnesota.

Seminar rooms and research study-rooms.
"Reserved book" rooms for groups of students.
Periodical-room.
Delivery desk in a central location.
Proximity of card catalog to delivery desk and main reading-room.
Proximity of stack work-rooms to card catalog and stacks.
"Browsing" or reading-room for recreational or cultural reading.
"Treasure-Room" for rare and expensive books, or those not for general circulation.
A room or rooms for special collections.
Map-room.
Comfortable and well-arranged working quarters for staff.
Women's staff rest-room.
Similar but smaller room for men.
Bibliography-room.
Exhibit panels in main corridor, or in delivery-room concourse for exhibit of rare books, prints or other subjects of special interest. Other exhibit space.
Bindery or repairing-room.
Provision for photostat or other photographic work unless provided elsewhere on the campus.

LIBRARY AT WHEATON COLLEGE. CRAM & FERGUSON, ARCHITECTS



THE LIBRARY AT WILLIAMS COLLEGE. CRAM & FERGUSON, ARCHITECTS

Provision for typing, multigraphing, mimeographing room.
Small rooms for debaters, committees, and other voluntary study groups.
Shipping-room.
Vault.
Toilet-rooms for the public.
Janitor's room.
A museum is sometimes included.

A modern stack is a self-contained steel structure set within a stack chamber. The stack should be 7 feet or 7 feet 6 inches between levels. Allowing 20 volumes to a square foot on each level, a stack chamber 30 x 40 feet, three levels high, will hold 24,000 books on each level or 72,000 in all. The allowance of 20 volumes per square foot is a maximum and may well apply to a college library. It is rather better to allow 18 volumes. This includes aisle space, book lifts, elevators, conveyors and carrels within the stack chamber. The proper method to figure the capacity of the stack itself is to seek the number of linear feet of shelving. It is safe to figure on the basis of full capacity 50 volumes per single-faced stack or 100 per double-faced stack for each linear foot of shelving of stack height. Actual working capacity is said to be 20 per cent less than full capacity. In the new Yale library the ranges of 16-tier stacks are throughout 4 feet 4 inches apart centre to centre. The range widths are milled so that the shelves can at any time be made adjustable for 8, 10, or 12 inch depth of shelving. The percentage of various depths of shelves was worked out by the librarian for the various classifications of books.

At Oberlin, which is the largest college library in the country and also the town library, the shelves are divided into 3-foot units of length and so arranged that the books within each unit and all related as to subject are upon detachable trays which can be lifted out, placed upon trucks and readily transported to any reading-table or seminar.

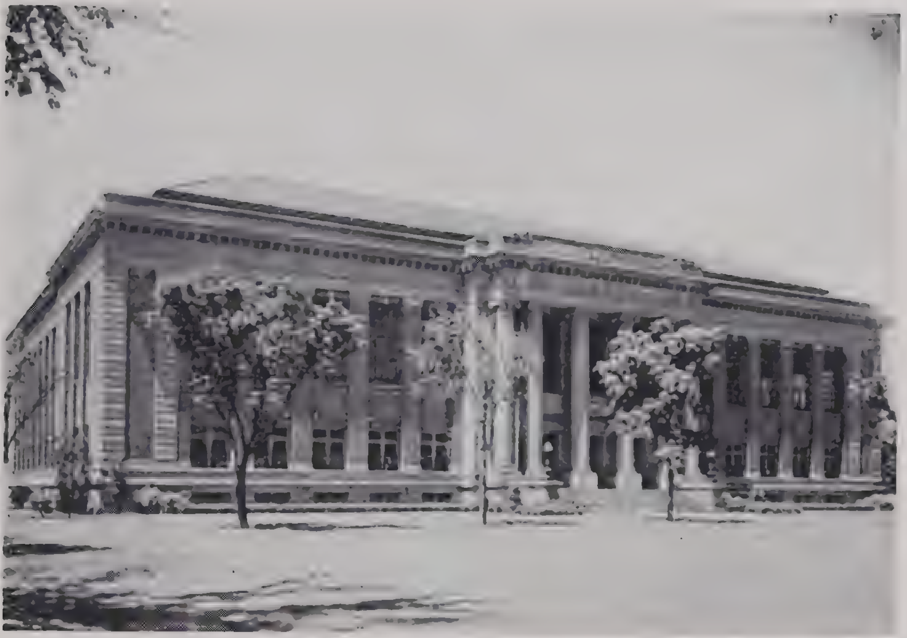
Access to the stack should be provided for special students. There should be space for the brief examination of books. The least accommodation under this head consists of reading shelves for standing readers at the ends of each stack tier, while the ideal arrangement is to have a large free area beyond the ends of the stacks and divided into alcoves or carrels, each with a commodious table. In order to facilitate the movement of books from the stack to and from reading-rooms and seminar rooms, certain levels of the stack should coincide with the floor levels of the building. Where this is not feasible, easy inclined planes for book trucks should be provided. Reading and other rooms, principally on the first and second stories, are made the height of two stacks unless a room is exceedingly large, when it is sometimes made a height of three stacks. The size of study-rooms and seminars is such that a floor to floor height of 10 feet 6 inches is reasonable. Two such heights would coincide with three stack floors, throwing only the intermediate floor out of alignment with the stack. For purposes of administration it is desirable to have the delivery desk as near the vertical and horizontal centres of the stacks as possible. Stacks of many stories require elevators and large stacks should have toilet facilities and a janitor's sink on every second level. Windows should be spaced opposite the aisles of the stack and should be as high as the total number of stories, and in addition the aisles should be thoroughly lighted by electricity. If the aisle floors be of glass, to the under surface of which electric lights be attached with control at each story of the lights upon its own ceiling and also the ceiling below, by turning the two switches the entire face of the story of books will be almost equally well lighted.

The number of present volumes known and agreement having been reached upon the probable yearly increase, the size of the reading-rooms becomes the next problem. The location of the building has a bearing on this. It has been pointed out that reading-rooms are used by students in inverse proportion to the number of other places existing on the campus suitable for study between classes. "Where students largely live in dormitories on the campus or near it there is likely to be a minimum space demand in reading-rooms."[1] Similarly, if the institution is in a small town where the students live mostly in the neighborhood of the campus and go home between classes except in bad weather, and if there are other convenient rooms for study such as those in the women's buildings or unions, the demand for reading space in the reading-room will be lessened. Yet students reading in dormitories are deprived of supplementary reference books such as dictionaries, atlases and encyclopedias. A large city institution will have more of this demand for space in the library, thinks Mr. Bishop; and Mr. Walter, the Librarian of the University of Minnesota, writes that "The size of our campus also affects this. It is entirely too far for a student to walk from one end of it to the other to go even to his own room if he has only one vacant period between classes."

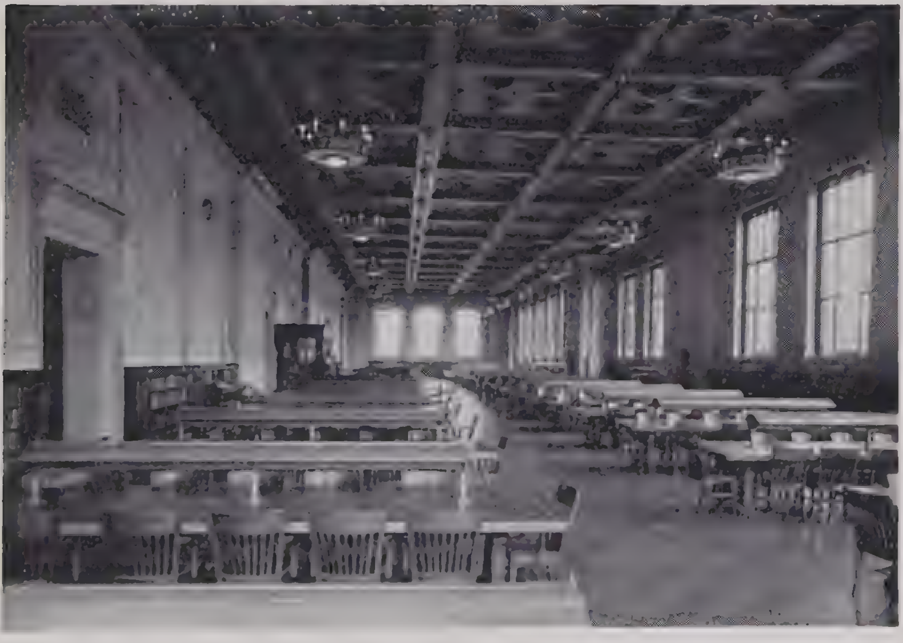
An experienced librarian who has given careful study to this subject[2] finds that 25 per cent of the college attendance should be the minimum for which all the library reading-rooms should provide seats at table. Mr. Root of Oberlin thinks one-third the student enrolment

[1] Mr. W. W. Bishop, Librarian of the University of Michigan.

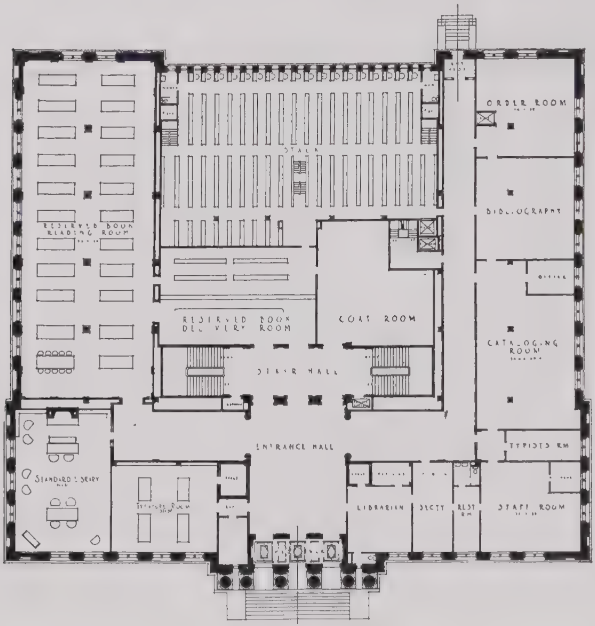
[2] Mr. James I. Wyer of the New York State Library.



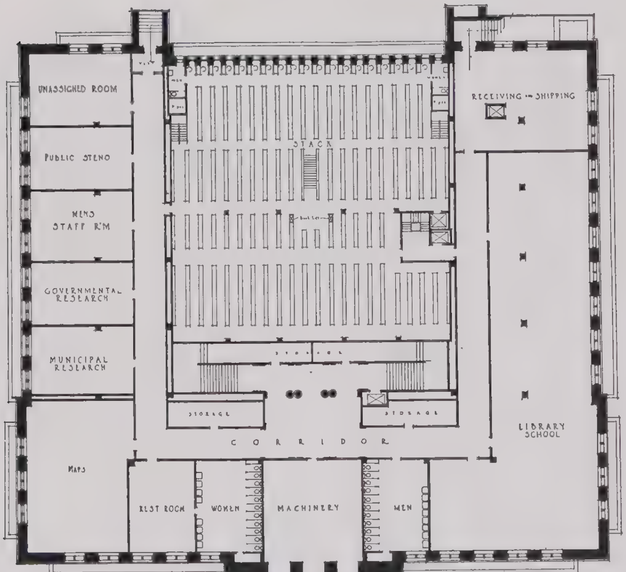
LIBRARY OF THE UNIVERSITY OF MINNESOTA. CLARENCE H. JOHNSTON, ARCHITECT



MAIN READING-ROOM OF THE LIBRARY AT MINNESOTA

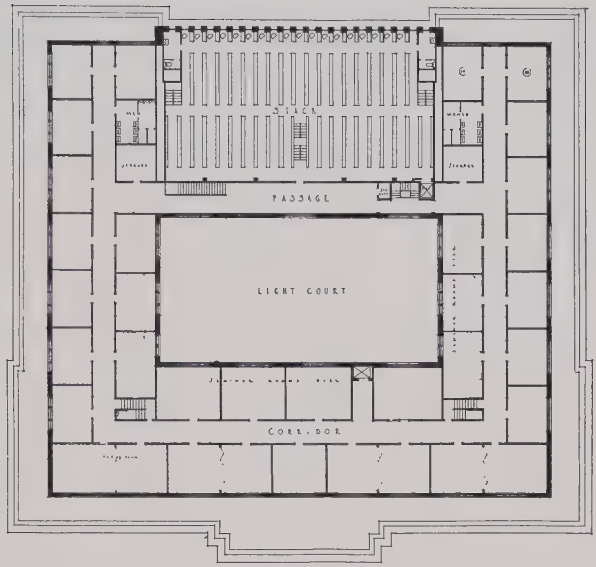


FIRST FLOOR PLAN

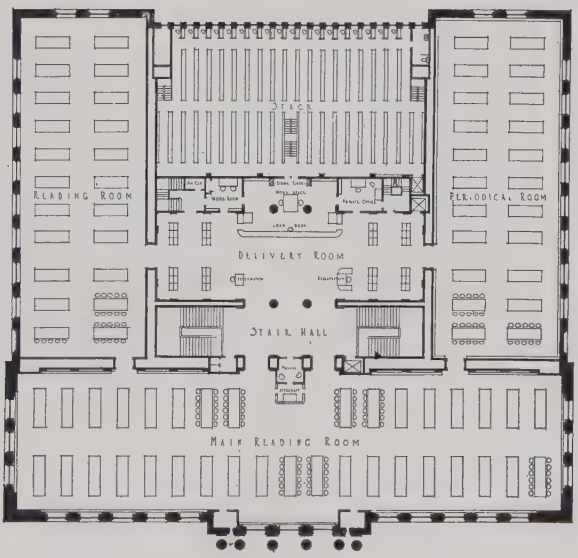


BASEMENT PLAN

LIBRARY, UNIVERSITY OF MINNESOTA: BASEMENT AND FIRST-FLOOR PLANS.
CLARENCE H. JOHNSTON, ARCHITECT



ROOF HOUSE PLAN



SECOND FLOOR PLAN

LIBRARY, UNIVERSITY OF MINNESOTA: SECOND-FLOOR AND ROOF-HOUSE PLANS should be accommodated at the tables, and the programme for the University of Chicago Library called for the same proportion. Michigan now has accommodations for 30 per cent. Another authority gives 20 per cent of the largest number of students in the college at any one time. The present tendency is in the direction of giving more space. It has been remarked that the percentage is likely to be higher at the colleges emphasizing the humanistic studies. If the student body consist of undergraduates, it is contended the demand for reading-room space will be greater than if it consist of graduate students, but on the other hand the area required by graduate students is greater than for undergraduates.

The capacity of the main or general reading-room of typical libraries is given in the following table:

	DIMENSIONS OF MAIN READING ROOM	AREA IN SQ. FT.	NUMBER OF READERS	SQ. FT. PER READER
Brown University	99′ x 47′ 8″	4,718	180	26.21
University of Chicago	140′ x 53′	7,420	364	20.38
Emory University	40′ x 140′	5,600	260	21.54
Widener Library, Harvard University	42′ x 192′	8,064	264	30.55
University of Michigan	50′ x 170′	8,500	300	28
University of Minnesota	50′ x 199′	9,950	420	23.69
Oberlin College	48′ x 232′	11,136	344	32.37
Yale University	34′ x 25′ 34′ x 140′ 33′ x 23′	850 4,760 759	258	24.69

In laying out the seating of a general reading-room an ample space must be reserved beside or opposite the entrance to the room for the reference desk. For the broadening functions of this department a space at least 10 x 12 feet is required. At the University of Illinois library it is 34 feet 8 inches by 18 feet 10 inches.

It is desirable to plan reading-rooms so that persons moving about to consult reference books should not be in the eyes of persons reading at the tables. As it is the point of view of this book that a library, as well as every other college building, should be beautiful as well as useful, the writers would modify one of the A. L. A. guiding principles to read as follows: Should there be such decoration of reading or work rooms as will attract sightseers, provision should be made that the visitors cannot disturb readers or attendants.

Imposing as these great general reading-rooms are with their lofty ceilings and their visitors' balconies, where one can behold every outward sign of intellectual activity within an architectural setting, experiments being tried[1] to adopt more and smaller reading-rooms indi-

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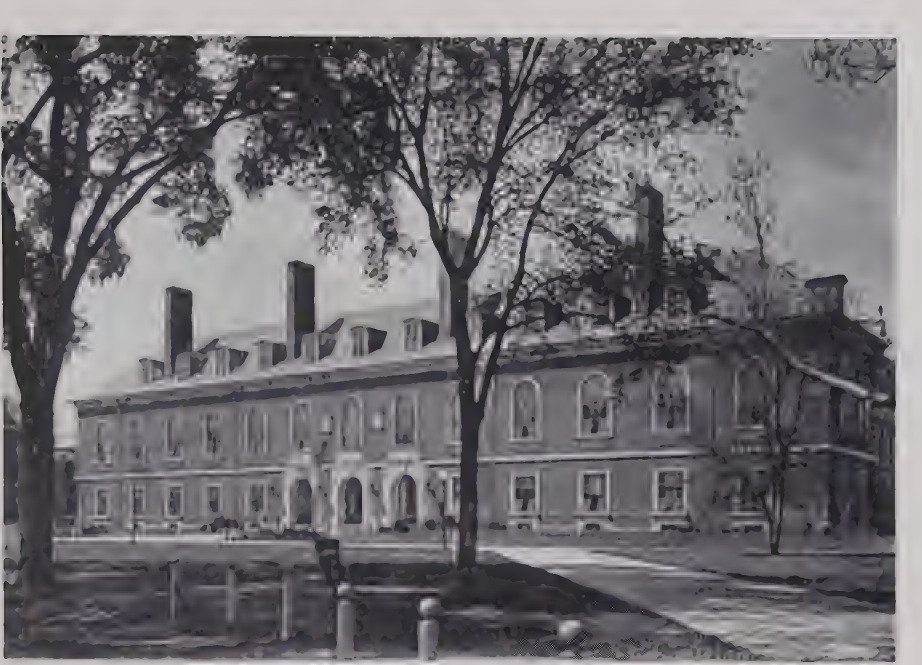
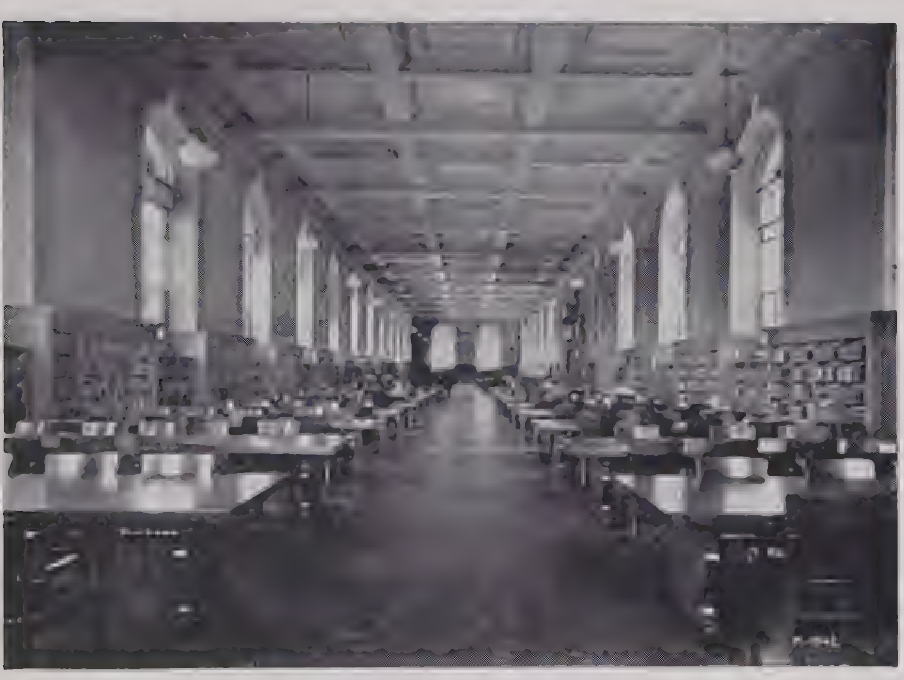
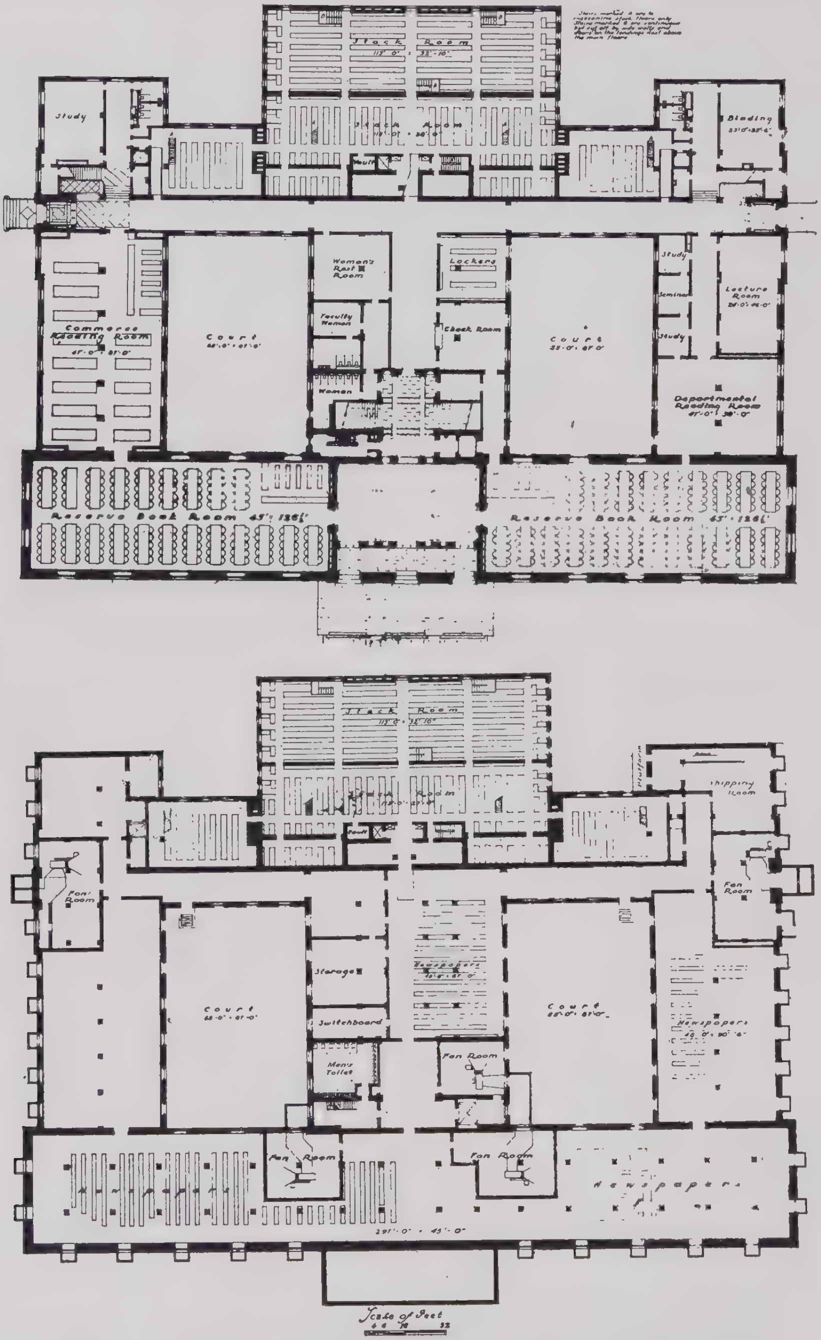
[1] *E. g.*, At Iowa State College.



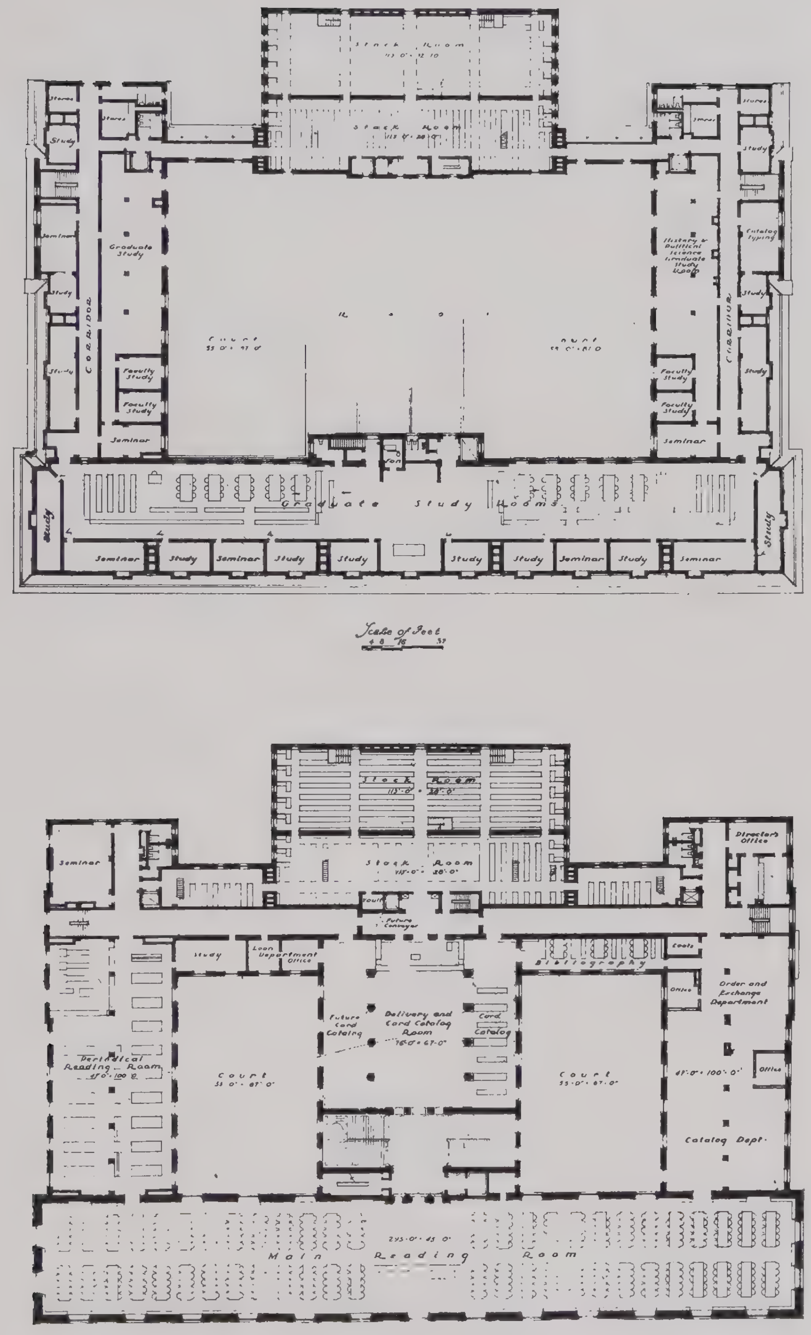
LIBRARY AT THE UNIVERSITY OF ILLINOIS.
CHARLES A. PLATT AND JAMES M. WHITE, ARCHITECTS



MAIN READING-ROOM OF THE LIBRARY AT ILLINOIS



LIBRARY, UNIVERSITY OF ILLINOIS: BASEMENT AND FIRST-FLOOR PLANS.
CHARLES A. PLATT AND JAMES M. WHITE, ARCHITECTS



LIBRARY, UNIVERSITY OF ILLINOIS: SECOND AND THIRD FLOOR PLANS cate a desire in some quarters for lower ceilings and more homelike spaces. We would not for a moment subscribe, however, to eliminating the great reading-room or "reading-hall," you may call it if you will, for there is inspiration in these stately voids where the mind seeking knowledge can expand amid the fruits of the past as expressed in the architecture that surrounds him at imposing distances.

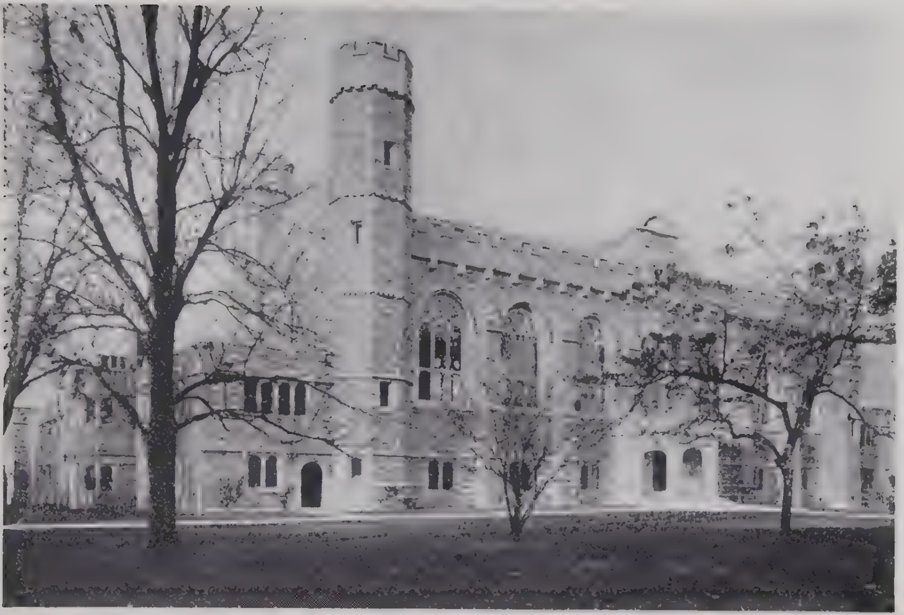
In addition to the reading-rooms given in the table on page 82, those of a complete university library should consist of one for undergraduates, a room for graduate studies and sometimes there is a reading-room for the exclusive use of the faculty. A reading-room in which smoking is permitted is an incessant demand at some of the large universities in the East. A part, if not all, of the facilities for graduate studies are disposed of in the table or desk accommodations we have described in the stack.

The reserved book-room is for collections of books on special subjects and related subjects brought together for the use of special groups of students and faculty. It has been said that such a collection, especially made, corresponds in a measure to the departmental library situated in a building other than the central library. It has manifest advantages of economy when housed in the central building; or these special collections may be sometimes for temporary use only; but it is desirable in any case to segregate these books from the general collection.

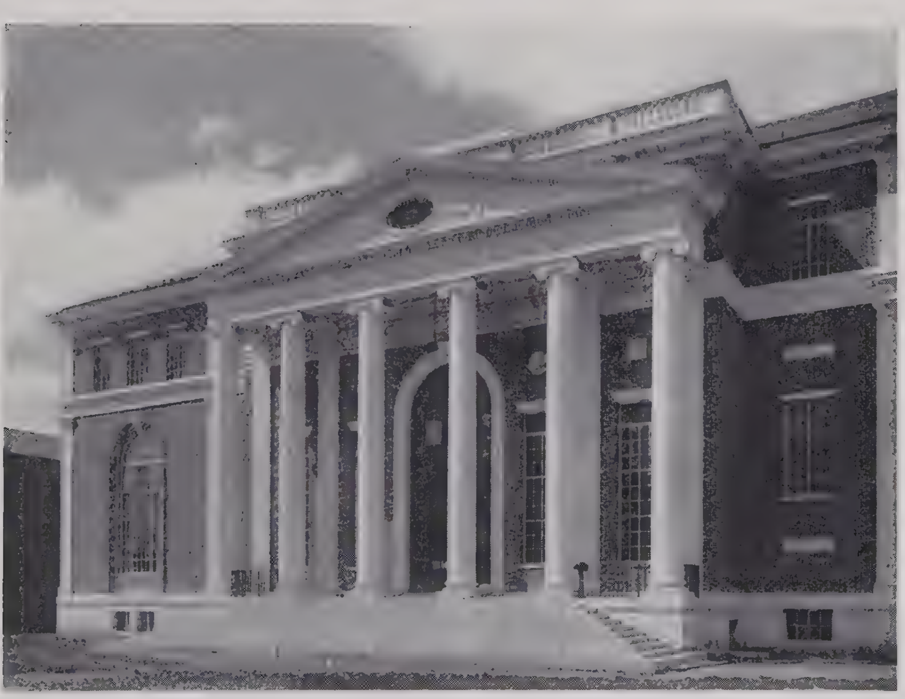
There may be a special room for newspapers separate from periodicals. The storage of newspaper files is a problem that has been met by the suggestion to keep them on cheap wooden shelves in dark spaces communicating with a seminar or special room. Bound newspapers of pulp paper will not stand the light and are so bulky that steel shelves are too expensive to provide storage for them.

In all large libraries the delivery desk is a focal area and presents so much activity that it should be placed in a central unit of the library plan and equally accessible from the entrance of the building, from the main reading-room and the two reading-rooms of next importance. It is essential that the card catalogue be close to the delivery desk. Opinion seems to be divided upon the ingenious scheme of having the drawers of the card catalogue slide through the case containing them and through the partition containing the case so that each drawer is accessible to the public outside the partition and to the staff working on the inside.

In small libraries, where there is a small staff, the delivery desk can be at one side of the main reading-room with its front opening upon the reading-room and its back to the stack. If the delivery room is



LIBRARY OF BRYN MAWR COLLEGE. COPE & STEWARDSON, ARCHITECTS



LIBRARY OF WESLEYAN UNIVERSITY. McKIM, MEAD & WHITE, ARCHITECTS separate, with an archway between it and the reading-room, the delivery desk and the overseer of the reading-room can be centred at one place. In this type of library the public card catalogue should be quite near the delivery desk, since in a college library the cataloguer is likely to be called on at any time to work at the delivery desk.

Work-rooms for the staff should be near the public card catalogue and the stack. These rooms as well as the librarian's own office may be arranged in the manner he describes as best suited to the operation of the library. Each worker should have 100 square feet allotted him.

Whether a museum or a room for assemblage is to be placed in the library building, should be determined by the administration early in the planning, for these are elements too large and important to be casually slipped into the design at the last minute.

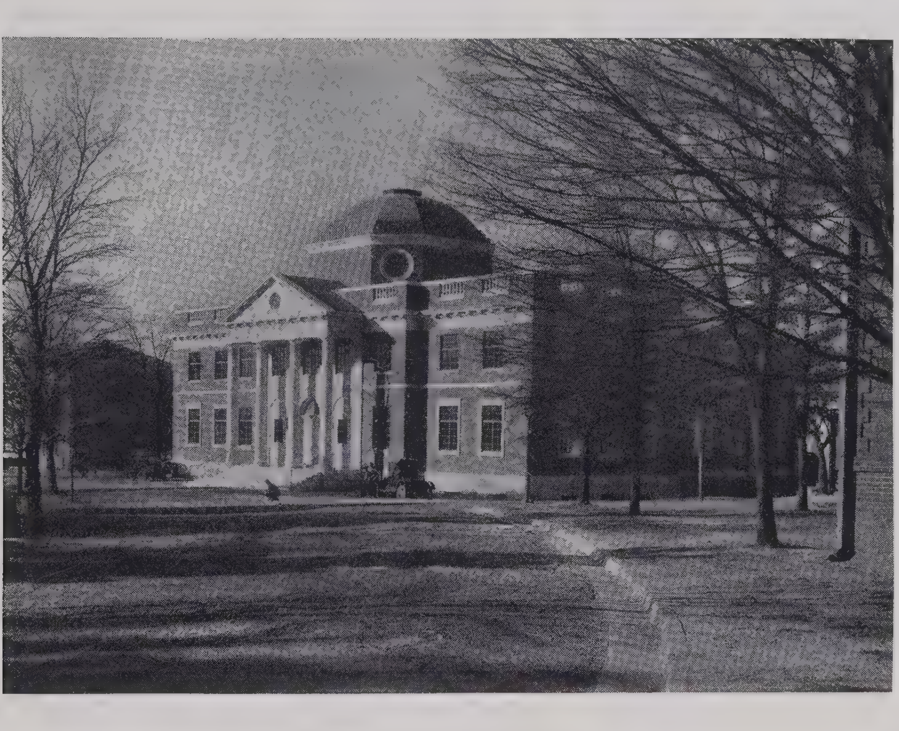
The majority of librarians interviewed are not in favor of having a bindery in the library building. As one librarian puts it, "It is much more satisfactory to send things to an up-to-date bindery where they can be handled by skilled workmen than to attempt to run a shop in connection with the library." It is said to be the opinion of librarians generally that there should be at least $5,000 worth of binding yearly to make it worth while for a library to consider the question of doing its own binding. All agree, however, that every library should have a repair room in which light work connected with the care of books can be done.

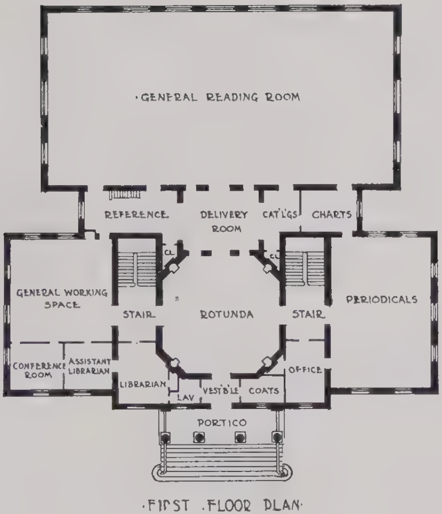
With the object of securing the greatest economy of administration there should be as few partitions as possible, that is to say, the smallest number of rooms to give the required capacity. Floors except in corridors should be of cork or linoleum to insure quiet.

The checking of wraps assumes large proportions at several times of the day when there is a rush for the cloak-rooms. Abundant space should be provided for the student's belongings which he brings to the building. The experience of each institution will point to some solution for this; and one of several satisfactory methods now followed by which each student checks his own effects may be adopted.

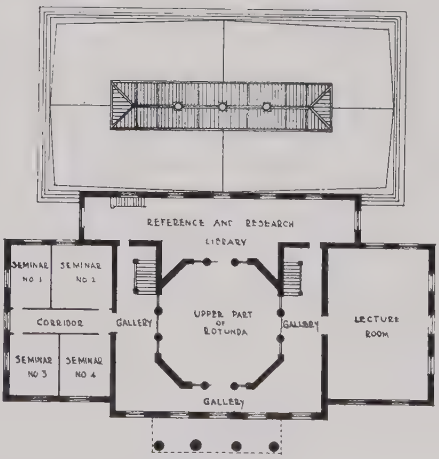
Neither high-up nor indirect lighting should be attempted in those parts of library buildings where people read at tables. We have noticed where this has been tried in the general reading-rooms of two prominent universities, the lighting is inadequate and injurious to eyesight. In these cases new methods of table lighting have been installed experimentally, and having met with approval are to be adopted throughout the reading-rooms.

The nucleus of about 330 volumes, bequeathed to the College in





·FIRST FLOOR PLAN·
·LIBRARY·



·SECOND FLOOR PLAN·
·LIBRARY·

LIBRARY, NORTH CAROLINA STATE COLLEGE HOBART UPJOHN, ARCHITECT

1638 by John Harvard, was destroyed (except one volume) in the fire of 1764. Numerous gifts quickly made good the loss so far as the number of volumes was concerned and Gore Hall was built in 1838 as the library building of Harvard. In spite of an enlargement in 1877, remodelling of the interior in 1895 and an addition built in 1907, it was still inadequate. It was torn down and its site occupied by the Widener Memorial Library dedicated on Commencement Day, 1915.

The plan consists of a hollow square about 200 x 250 feet on the outside. The great reading-room occupies the whole north front of the second story. The periodical-room adjoins it upon the left. At the right is the delivery room with the public catalogue containing over a million and a half cards. The stack extends across the rear and at present consists of 8 stories with a capacity of 1,700,000 volumes. It may eventually be extended downward into the basement, adding two more stories with a further capacity of nearly 500,000 volumes. The various reading-rooms and special libraries have shelving for about 160,000 volumes in addition. Outside of this general library, there are 11 departmental libraries and 25 special libraries at Harvard with a total of about 1,250,000 volumes. Along the upper six stories of the stack are 300 alcoves for private study and in close connection with the stack there are also 70 private studies from 10 x 12 feet to 12 x 15 feet in size for the use of professors. In the third floor over the stack are 26 seminar rooms.

The library at Berkeley, Cal., was erected in 1911 and consists of a nearly square plan with the stacks occupying a large square area near the centre. The plan shows all the essential principles carried out and with wide latitude for expansion. It is only wanting in some details which in recent years have been found desirable by university librarians.

An interesting scheme for a general library of a university and relating it to the academic activities was that proposed by a commission appointed to investigate and report upon a new library building for the University of Chicago. It was "recommended that the main library building be made the centre member of a group of nine buildings, which should include buildings for the Divinity School, the Law School, the Historical and Social Science Group, the Philosophy Group, the Classical Group, the Modern Language Group, and the Oriental Group; that each of these buildings contain a departmental library for the departments housed in it; and that the buildings be so constructed that the reading-room of each departmental library should be on approximately the same level with that of the central building and in easy communication with it by bridge or otherwise." What is now the William Rainey Harper Memorial Library, designed by Shepley Rutan & Coolidge and completed in June, 1912, constituted the central building. It is 262 feet long and 81 feet wide, the highest point of the towers being 135 feet above the ground.

The plan of the library at the University of Minnesota is nearly square, with a twelve-story stack shelving approximately 1,500,000 volumes at the rear. The style is Roman Renaissance, and the walls are of face brick with Bedford limestone for the trimmings and six-columned Ionic portico. The main reading-room in the second floor extends across the front of the building. It has walls of Mankato Travertine stone and a ceiling of modelled plaster beams with coffers painted in subdued tones of green and gold.

The library at Illinois is a brick building in the Georgian style and one of four structures facing the south campus at Champaign. The present building represents about one-fourth the size of the structure when ultimately completed so as to extend around a stack that will have a capacity of 5,000,000 volumes. The walls are of red brick of mingled color tones. The reserved book reading-room is on each side of the entrance on the ground floor; the main reading-room, with the delivery-room near by it, extends across the front of the building above.

The library at Iowa State College is monumental in style and has a capacity of 250,000 volumes. The main reading-room, extending across the front of the second floor, accommodates 300 readers. It is interesting to note that observations made here have indicated a preference of many of the students for the smaller reading-rooms as places for study.

Of the great library being erected for Yale Mr. Andrew Keogh, Librarian of the University, writes: "Good light, flexibility of construction to provide for changing needs, quiet, comfort, quick service for readers and an inspiring atmosphere were the general stipulations to the architect, and his solution will give us a building as efficient as an up-to-date factory and as beautiful as a cathedral." Its capacity will be about 3,000,000 volumes, and it is planned to add stacks for another million when the occasion arises. It will contain 50 studies, seminar rooms and rooms for special collections, all these rooms being interchangeable.

The chief and essential difference between a college library and a university library is that the former should be designed first of all to permit direct access to its books on the part of the entire student body and faculty, whereas it is impossible to design a university library to house nearly a million volumes and at the same time have them accessible to a resident population of 10,000, of whom at least a fifth are likely to come to the library at the peak periods. This is the opinion of Mr. Bishop, who, as librarian of the University of Michigan, is familiar with the problems of a large institution where there are about 5,000 readers daily during the busy months of the year notwithstanding other libraries and pleasant study halls upon the campus tending to relieve the burden of the general library.

The housing and administration of special libraries are fraught with numerous difficulties respecting their relation to the general library, such as accessibility, the duplication of volumes and the overlapping of scope and the like. An idea of these problems may be obtained from the minute rules upon title acquisitions and separation in the stack of the Hoover War Library from the main library at Stanford University. A special library of size could be housed in a wing of the general library were it not that by so doing the unity and efficient operation of the latter structure may easily be impaired. Stipulations in a bequest may point the way to a separate building for the special library, but the erection of such a structure is not always so happily accomplished as in the William L. Clements Library of Early American History at the University of Michigan or the John Carter Brown Library at Brown University. In these cases the special collection has a general appeal. If the collection is of another sort, closely akin to a technical department, there must be quick accessibility by the same student to both the special collection and the principal one. If the income of the special library outruns that of the general library and permits more rapid acquisitions, other problems arise for an administration having heed of the proper relative scale of the two.

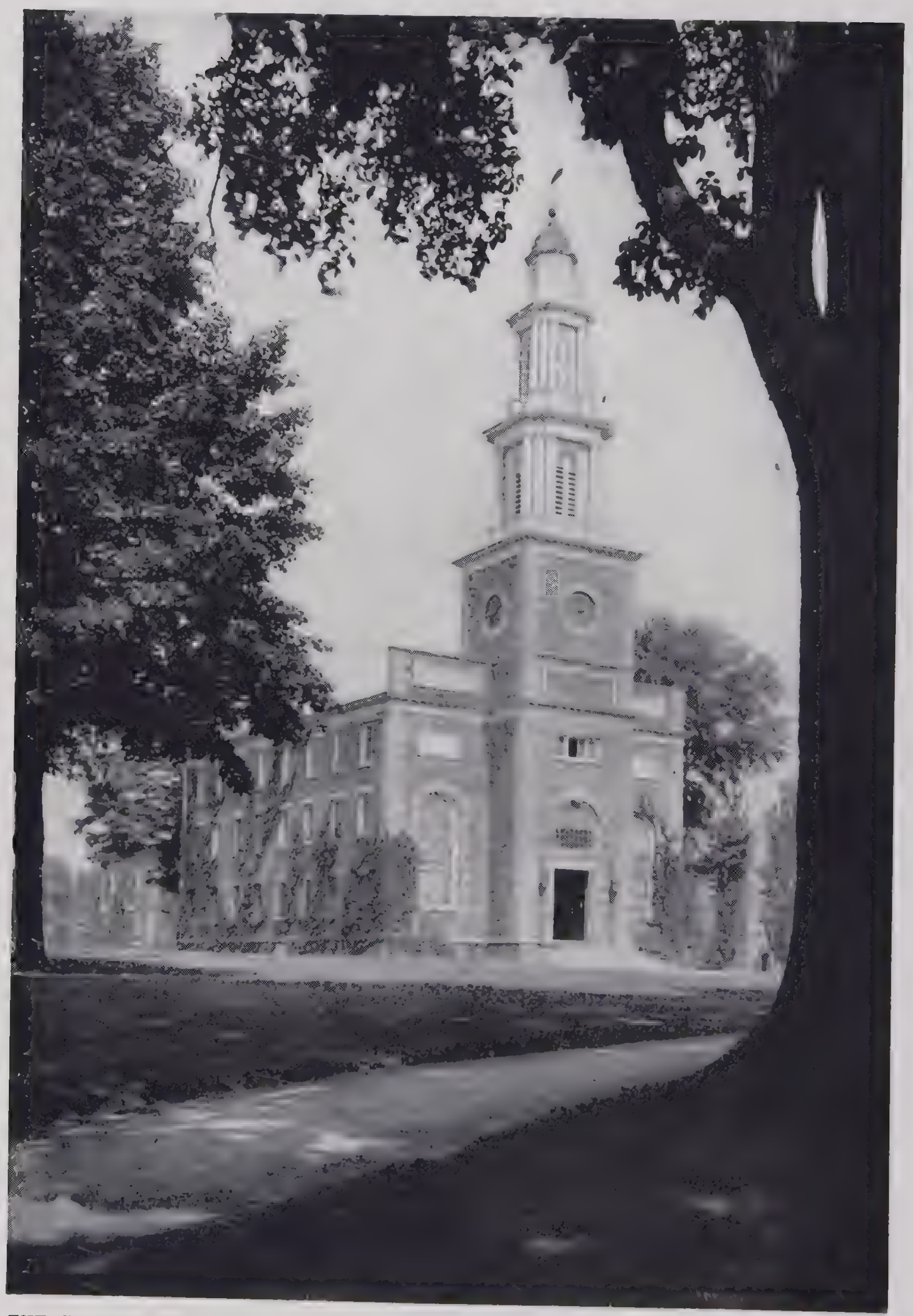
CHAPTER VI

CHAPELS AND AUDITORIUMS

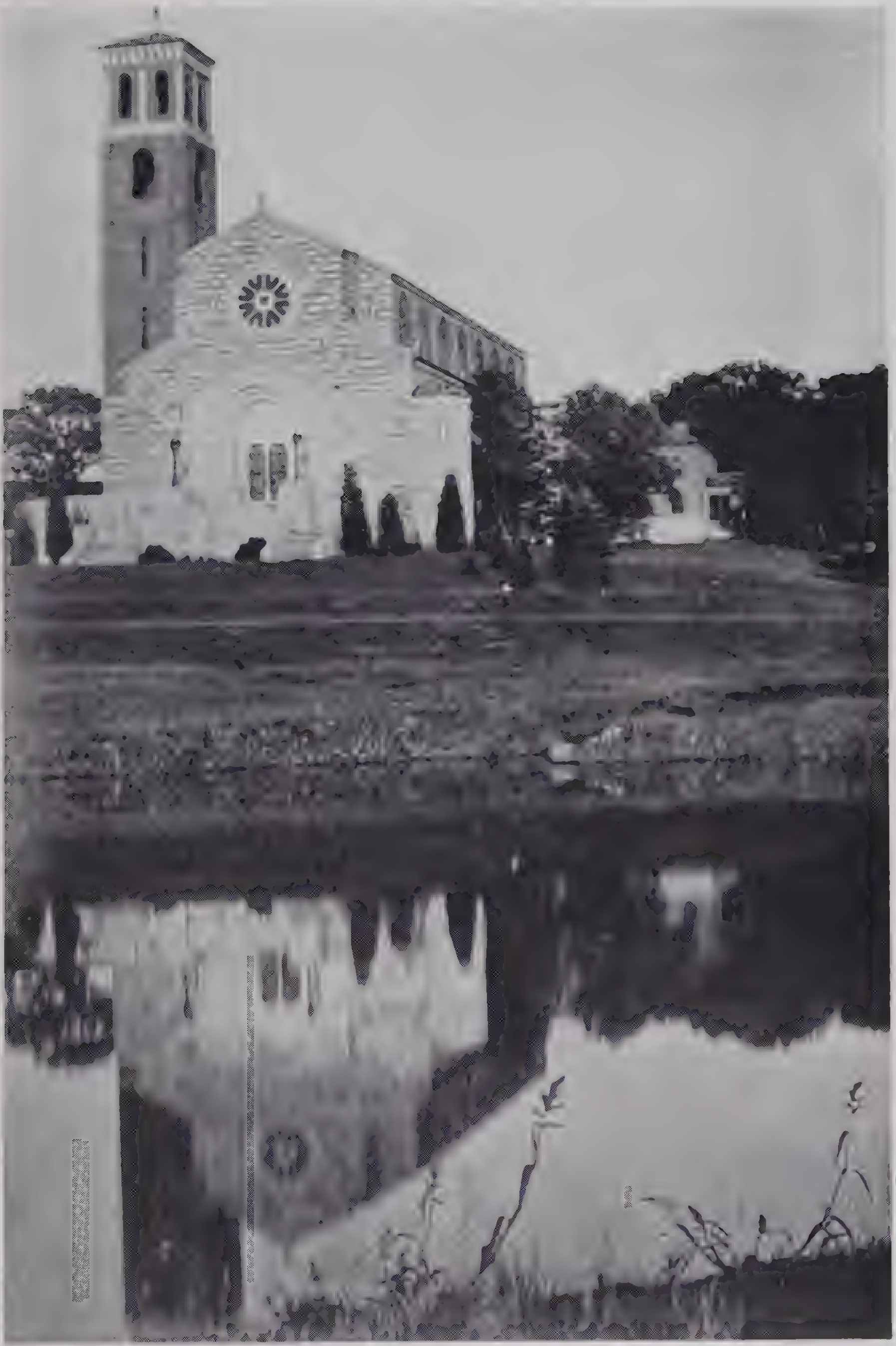
THE inspirational value of fine architecture at college or university having been conceded, in what building can it be more appropriately found than in the chapel? The architect should marshal the allied arts to tread beside his own toward the creation of this, a fitting sanctuary of the Lord. Here there is escape for the architect from the dominance of the utilitarian; there is freedom to pursue an ideal. Freedom? Yes; but in church design this is a highway marked out by tradition, the tradition which is the law of church building but which does not standardize it, which permits variation, imagination and a measure of personality but subordinates idiosyncrasy. The way is lighted by truth, reverence, devotion and sacrifice. Nowhere in church building should there be a false note. The fabric must be beautifully and honestly wrought. Its materials must be genuine, for truth and permanence are the root of all that is architecturally good. Doubtless Sir Christopher Wren had chapels and churches in mind when he wrote: "Building certainly ought to have the attribute of Eternal."

Whether chapel service be required or voluntary, an edifice for the spiritual needs of students should be provided and devoted solely to that purpose. The structure should be churchly in plan and in its general appearance. It need not be grandiose so long as it compels instinctive reverence. To attain this elaboration is not essential. But there should be no doubt in any one's mind whether it is a House of God devoted to His service or a building used for divers other purposes.

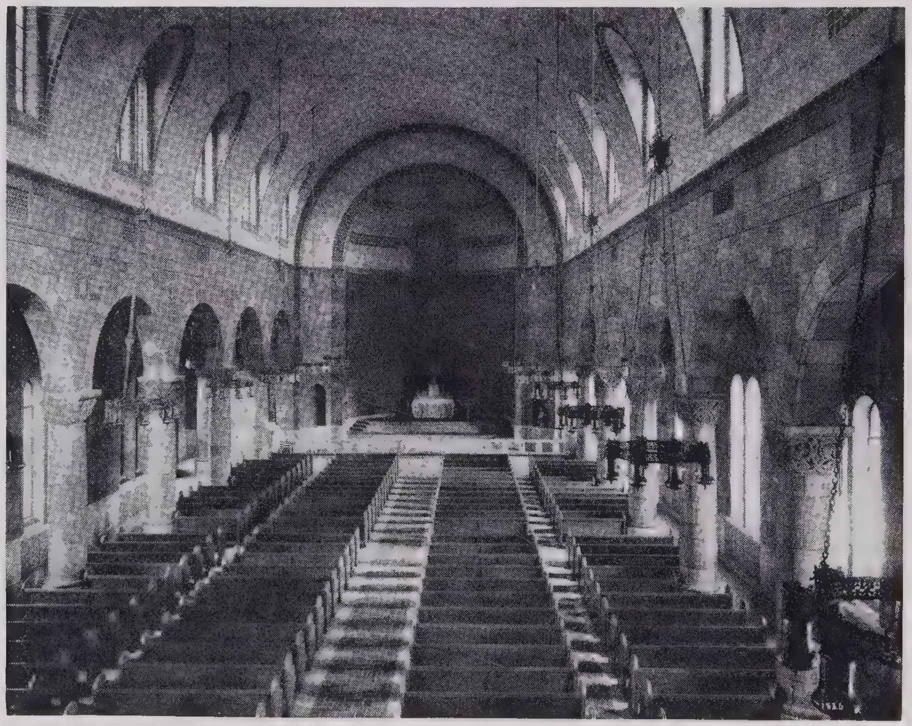
Notwithstanding the fact that most of our institutions of learning were established by church denominations as extensions of their religious teaching, the force of religion in college and university life, as expressed by attendance at service at least, appears now quite indeterminate. Witness an unwillingness of a part of the student body to attend, a relaxing of compulsion to attend, an entire absence of religious exercises at some institutions. On the other hand are seen the Christian colleges holding true to their ideal of education integral with religion; and the present year witnesses the erection of the most ambitious university chapels ever seen in this country. (Of the two universities where these are being reared, one abolished compulsory

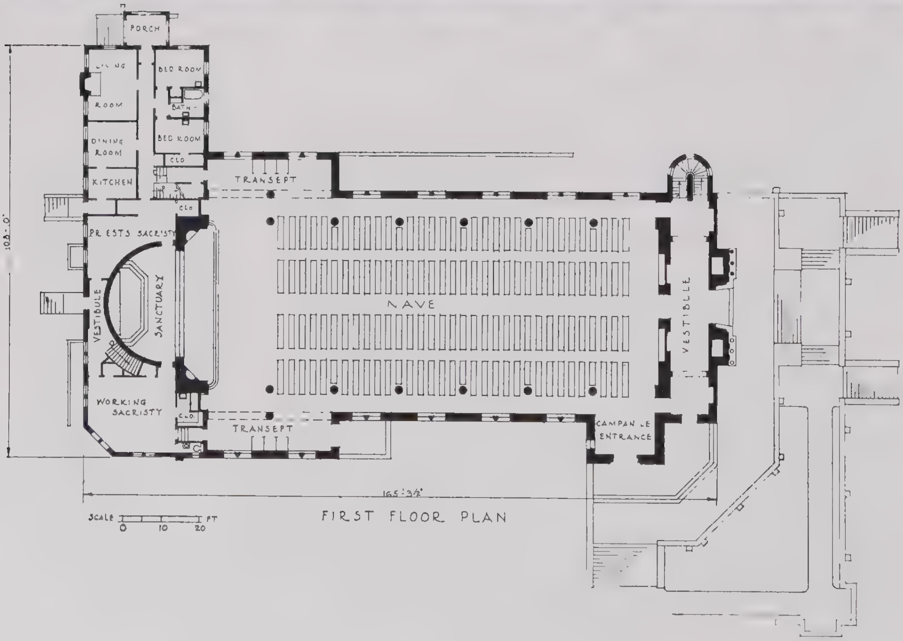


THE CHAPEL AT HAMILTON COLLEGE. ERECTED 1828. PHILIP HOOKER, ARCHITECT



THE CHAPEL AT ST. CATHERINE'S COLLEGE, ST. PAUL. H. A. SULLWOLD, ARCHITECT





THE CHAPEL AT ST. CATHERINE'S, ST. PAUL

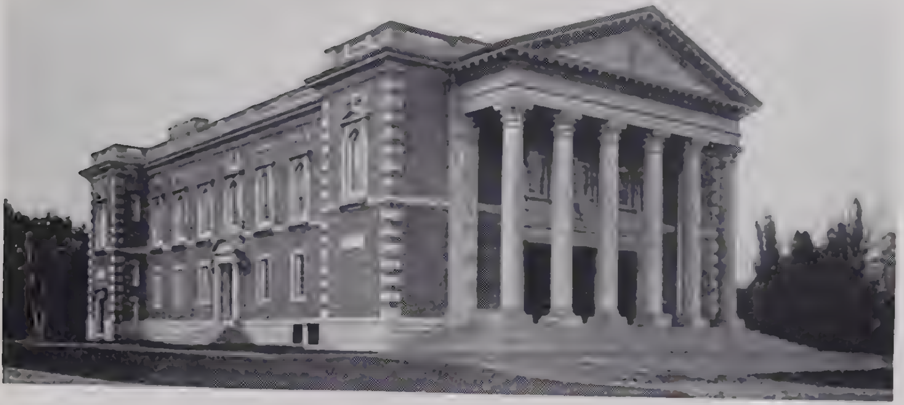
attendance after construction of the chapel was commenced; the other requires attendance at the Sunday service only.) The Christian and other religious associations pursue a wide-spread activity in keeping religious interest alive by means of Bible study, mission classes, convocations upon social service and the like, any or all of which a student may support or not as he chooses. Perhaps the answer to the enigma is what one of our many gracious correspondents suggests as "a phase of the spirit of self-determination which has so markedly grown up everywhere in the world."

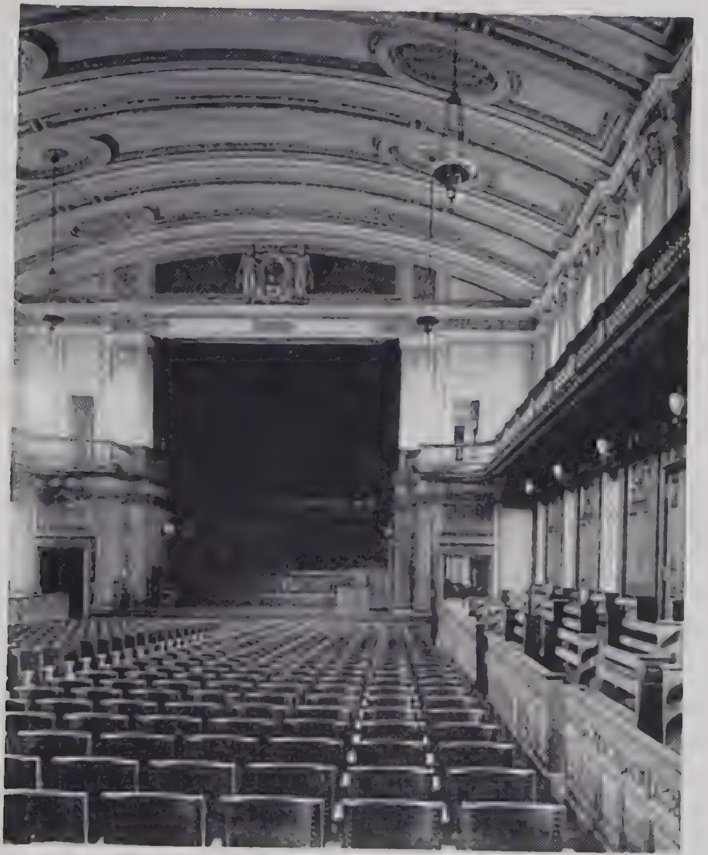
There seems to be a deep-rooted belief that *all* church architecture should be Gothic, notwithstanding the fact that the basilica type of structure has satisfactorily served the needs of the Roman Catholic ritual, despite the singular architectural merit of the churches of Lombardy, the beauty of the English Renaissance at the hands of Wren and the charm of early American churches, which are a development of the Puritan meeting house of worship. There is, however, a mysterious and scarce definable quality in the Gothic style that enables it to express most fittingly the spirit of a church. The chapel at Western Reserve, at West Point, at the Universities of Chicago and Princeton tell their own story. The aspiring proportions, the contrast of light and shade, the rows of arches on piers and colonnettes, now obstructing and now freeing the gaze, and hovering above all the inscrutable distant shadows in which the definition of vault, roof and all else is lost in a mystery that spurs the imagination and awakens an ecstasy of spirit; these are some of the inherent qualities of a style that seems to minister best to religious purposes. It is a style that has been fully developed in the mother country for churches of all sizes; and we as an English-speaking people should give consideration to the precedent there. It is self-evident, however, that where an architectural norm has been established by existing buildings that norm should be maintained in the design of the chapel. In other styles inspiration should then be sought, the precedents studied which have given impulse to such architectural achievements as the chapels at Columbia, at Trinity College, Washington, D. C., at St. Catherine's College, St. Paul,—to name but these.

At a university with heavy enrolment in a great city like Chicago, a small chapel as a retreat for meditation and prayer is highly valued, even though there are two other larger edifices for devotional purposes. The Thorndyke Hilton Memorial Chapel of the Chicago Theological Seminary, an institution allied with the University of that city, is a singularly fine example of such a building. Standing close to the street, its doors open daily, "it is a refuge from noise and confusion, an isle of quietness in the ebb and flow of bewildering life." It has an interior of rare beauty, with floor and walls of stone and with a panelled and arched roof. Various student groups hold their communion services here. Weddings may take place and funeral services may be held in this "sanctuary dedicated to the spiritual life."

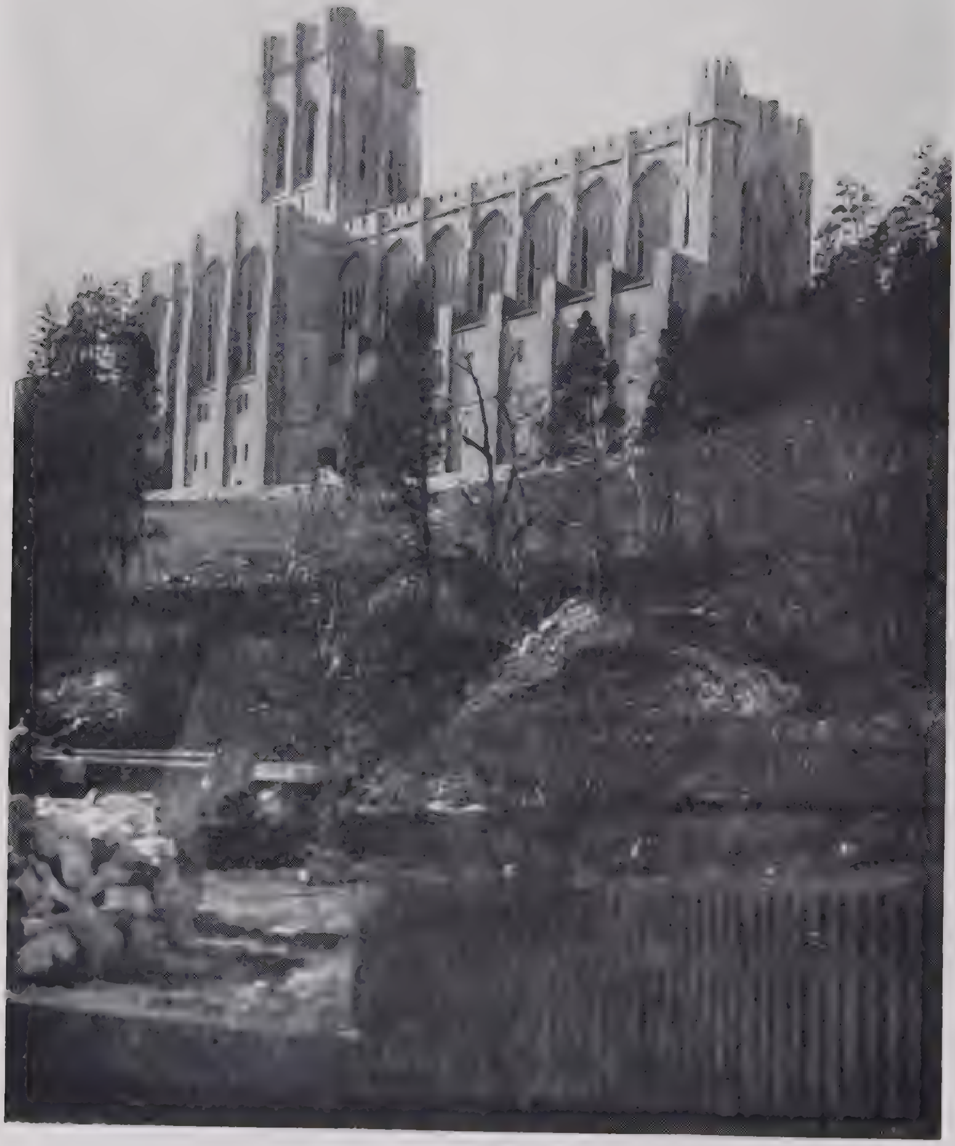
In planning a chapel to seat a larger proportion of the student body, of primary concern for the architect is whether it is to be of the ecclesiastical or of the auditorium type. We have found that, unless the foundation is either Roman Catholic or Episcopal, there is an urge for the latter form. Curiously enough there is also a preference expressed by the same denominations for a Gothic chapel. This may be merely the deep-rooted prepossession already mentioned in favor of Gothic. To the authors, however, it appears, if not a contradiction of terms, certainly a paradox for the designer to embody in the one and the same edifice a Gothic and an auditorium form of chapel. Now an essential of a Gothic chapel is a narrow nave. If the chapel is to be large and seating must be placed in the side aisles, a small number of seats will be deprived of a full view of both pulpit and chancel. This should be deemed a disadvantage of small consequence, especially when compared with the large architectural results to be achieved. If, however, the demand prevails for a religious auditorium, by which is meant a great space free from any supporting columns, Gothic should be foregone and the architect left free to provide the utmost number of seats, all with a full view of the speaker.

Colleges describing themselves as "distinctly Christian but undenominational" are obliged to have a chapel adapted to that broad and tolerant religious thinking to which the colleges have made a great contribution, a chapel adapted to a spoken and musical service without ritual and non-sectarian. In order to gain seating capacity, free from any impediment to the view, a short and wide nave with transepts will probably be adopted,—the shape of plan in a word which will place the greatest number of seats equi-distant from the pulpit. A balcony extending clear across the width of this hall and returning along the sides enlarges the seating capacity. It is possible for such an interior to be architecturally impressive and beautiful, but it cannot be Gothic. Examples of this auditorium type can be found in the Ira Allen Chapel at the University of Vermont, in the Finney Chapel at Oberlin, in the Memorial Church at Stanford, in the College Chapel at Williams. In these Romanesque, Lombardic and Renaissance sources are drawn upon. The Colonial or Georgian tradition presupposes a nave with balconies in the side aisles. Note the chapel designed by Philip Hooker and erected in 1838 at Hamilton College, also the one





CHAPIN HALL AT WILLIAMS COLLEGE.
CRAM & FERGUSON, ARCHITECTS



THE CHAPEL AT WEST POINT. CRAM, GOODHUE & FERGUSON, ARCHITECTS

INTERIOR OF THE CHAPEL AT WEST POINT

of recent date at Wheaton College. In the West the Spanish mission style has afforded a medium for chapel design.

It is not, of course, necessary that the chapel of a small college should be of greater scale than the English village church. This is a type universally recognized as intimate, lovable and charming, and of which numerous examples are before us by illustrations, nor is it difficult to visit the originals. The nave can in these be made as narrow as 20 feet, and with pews seating 5 persons on each side of a central aisle, the distance apart of the pews from back to back being 31 inches, the length of the nave and resultant size of the building can then be ascertained for a seating capacity of let us say 200. The distance from the rear (west) wall to the chancel parapet would be probably fixed at about 68 feet. The crossing is not developed nor are the transepts deeper than bays in one of which the organ may be placed. At the entrance or at one side of the western façade is a suitable place for a tower. This feature carried to the lofty proportions of a campanile is found at the Ira Allen Chapel (Vermont) and at the Chapel of St. Mary of the Angels, College of St. Teresa, Winona, Minn.

From these elementals chapels may be enlarged and elaborated until finally expressing the premeditated grandeur of those at Princeton and at Chicago. Each of these has a seating capacity of nearly 2,000. That at Princeton has a nave 38 feet wide in the clear and is 275 feet long and 112 feet 10 inches wide over all outside. The chapel at Chicago is 265 feet long and 103 feet high from the ground to the ridge over the nave, the tower being 100 feet higher.

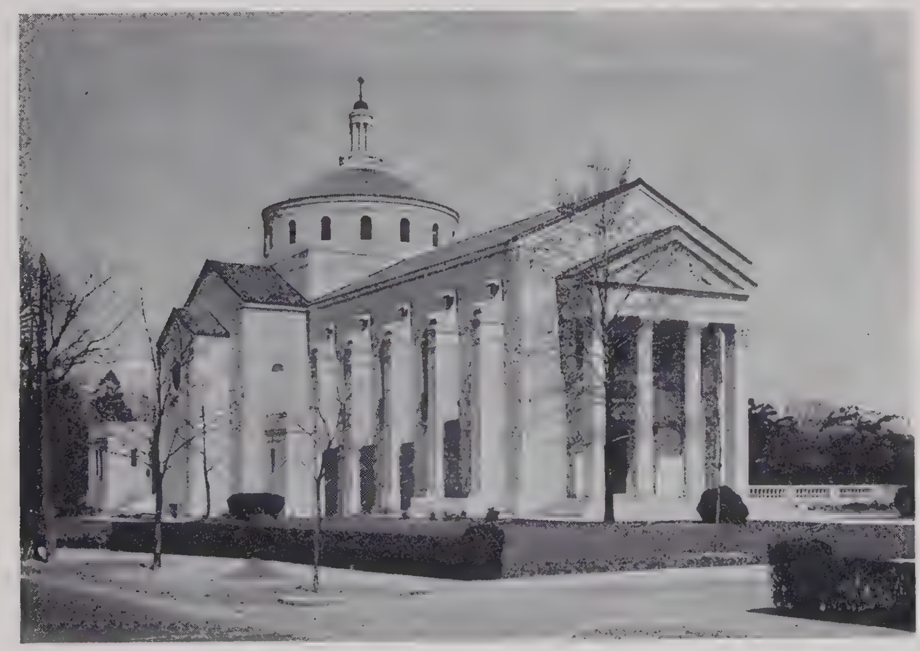
If the chapel is the architectural language of homage to the Deity, there is another type of structure having a kindred aim in so far as it expresses sacrifice to an ideal or a tribute to the memory of the deceased. It is a tower or campanile. Outlined against the sky it can only be viewed while looking heavenward. Although not utilitarian, it may bear a clock and contain chimes,—the one as useful as the other is enjoyable.

On account of its great height, it is of vital consequence for architectural reasons to locate such a monument with great care. To place it casually is to demean it. To place it in the midst of a campus of irregular outline is to lose a valuable opportunity. It should be located, if not at the intersection of two axes, upon one of them, thus helping the most casual beholder to sense the arrangement we have emphasized as essential in a group of college buildings. If the group plan is informal without axes, the tower should at least be placed upon the projected centre line of its most important neighboring structure.

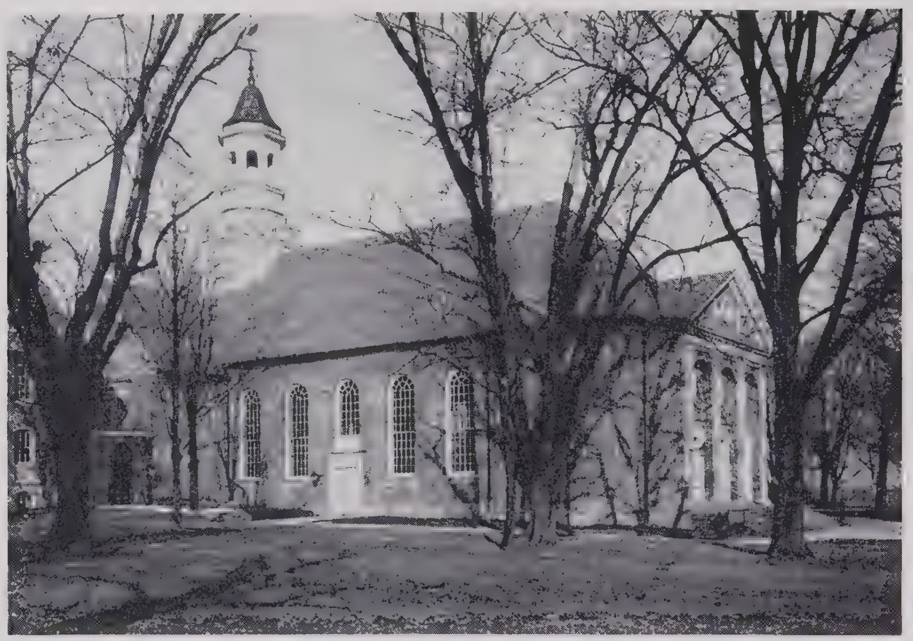
Campaniles attached to chapels have already been mentioned. Those at Iowa State College and at Brown University are detached structures, each having a clock, the former also chimes. At Louisiana State University the campanile, 165 feet high and with clock and chimes, has for an extensive base the Soldiers and Sailors Memorial Building. At Berkeley, Calif., the Sather Tower rises to a height of 307 feet. It has a clock and bells and also an elevator carrying visitors who wish to enjoy the fine view of the Bay region the summit of the tower commands. In one of the rooms at the base the drawings of the Phœbe Hearst Architectural Competition are exhibited.

Auditoriums

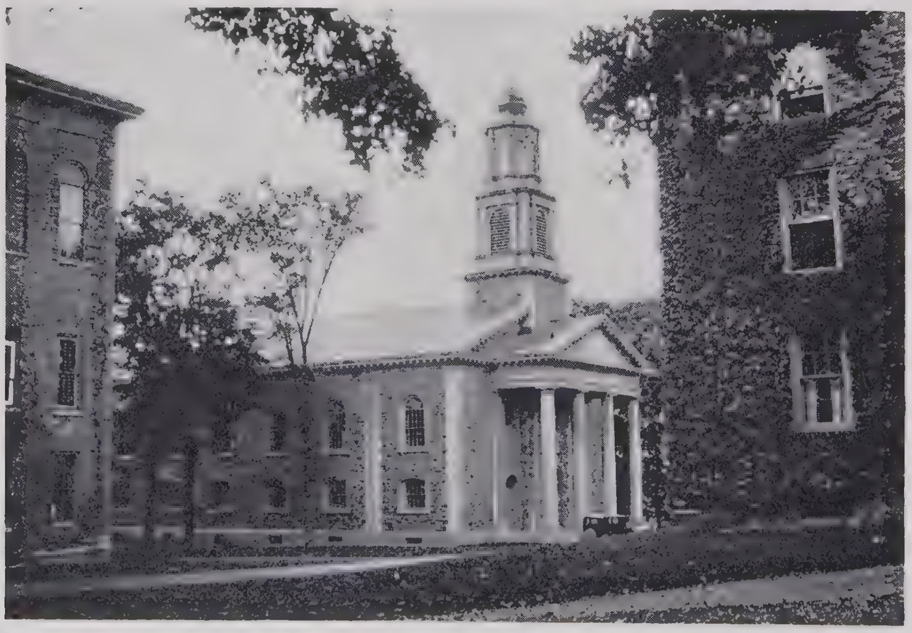
However commodious a chapel there may be, a separate auditorium as a place for meetings having no religious character, for lectures and for concerts, is highly desirable,—at a large institution, essential. As a college president writes, "It is by many felt to be out of taste to hold an athletic pep meeting in the chapel." Lacking auditoriums the straits to which some large institutions are put immortalizes an ingenuity of mind combined with physical exertion. We recall one in



CHAPEL AT TRINITY COLLEGE, WASHINGTON, D. C. MAGINNIS & WALSH, ARCHITECTS



HENSEL AUDITORIUM AT FRANKLIN AND MARSHALL COLLEGE

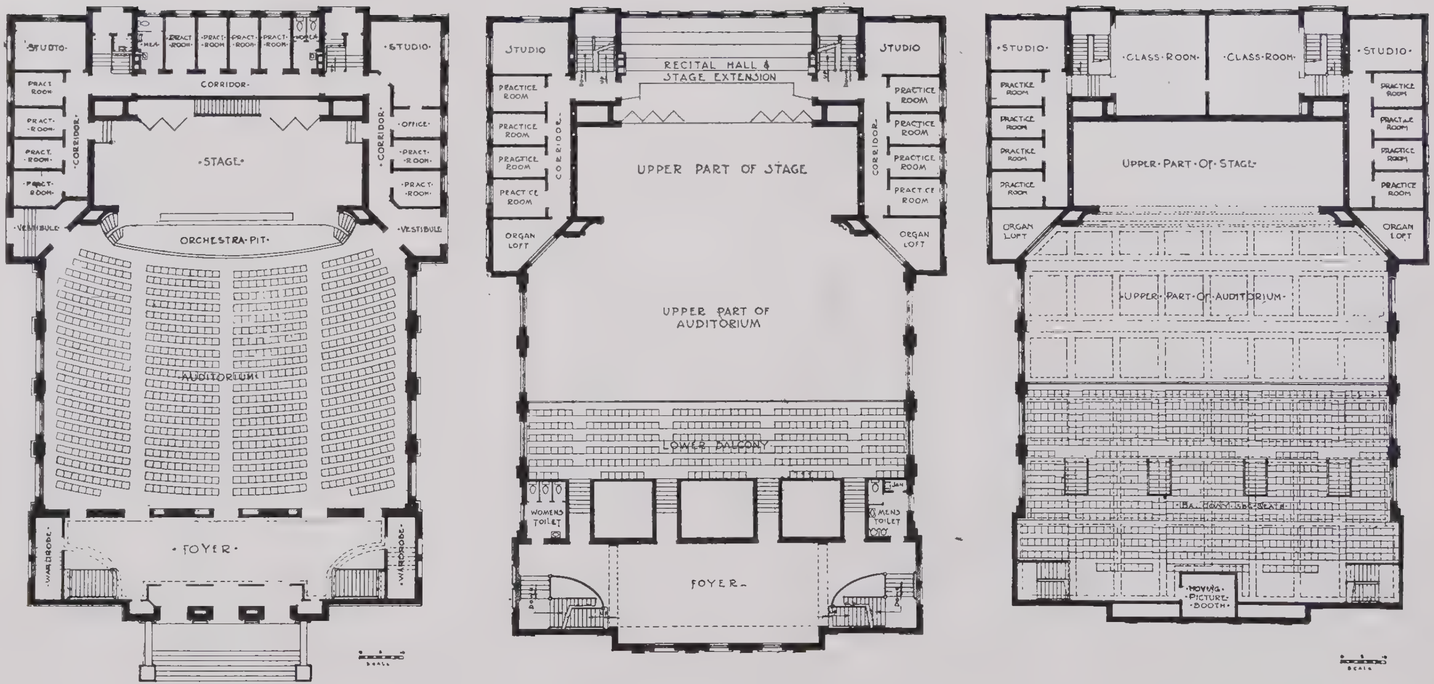


THE CHAPEL AT COLGATE. HARDING & SEAVER, ARCHITECTS particular where a famous prima donna has repeatedly sung to a capacity audience in—the cattle judging pavilion. The building was, of course, groomed and decorated for the occasion, but its every-day use was not wholly obliterated, for there under the concrete seats occupied by enraptured thousands of human beings, comfortably munching their feed in their accustomed stalls and perhaps equally enraptured, were the rightful denizens of the building, the work horses of the buildings and grounds department and a few cows. The acoustics were pronounced perfect.

Extensive seating capacity is a foremost consideration in an auditorium, for it is necessary in so far as it may be possible to accommodate at times the entire student body as well as a part of the public. Where enrolment exceeds four or five thousand this task passes beyond the realm of the possible, as it would hardly be feasible to seat so large a number within satisfactory hearing of a speaker in a building that, being only occasionally used, would justify the cost outlay. Those infrequent assemblages that include all the students and their friends would doubtless continue to be held in one of the buildings of the department of athletics. Seventy-five feet is supposed to be the greatest distance the voice will expand horizontally, but broadcasting technic of to-day bids fair to overcome any such limitation.

A second essential of an auditorium is acoustical perfection, in so far as this is possible of attainment, for it depends on the shape, the size and the materials of the interior. The specific factors in this problem are loudness, echo, reverberation, interference and resonance. For speech loudness and clearness are desired, but for music a certain degree of reverberation is advantageous. "Good design," we are told by the acoustical experts, "consists in making the loudness of the distributed sounds as great as possible consistent with not excessive echoes or reverberation."

The platform will project from a comparatively shallow recess having a permanent rear wall, and at the side there will be entrances from anterooms or dressing rooms in addition to steps reaching the front of the platform from the audience floor. Modern construction fortunately offers the cantilever system for sustaining the balconies, so there need be no supports or other obstruction to the view. An example of a small structure that has been favorably commented upon is the Hensel Auditorium at Franklin and Marshall College. Representing the other end of the scale of size and accommodation may be mentioned the auditorium for general university purposes, erected in 1908 and seating 2,100, at Illinois and the Hill Auditorium, seating approximately 4,500, at Michigan. An interesting departure from a



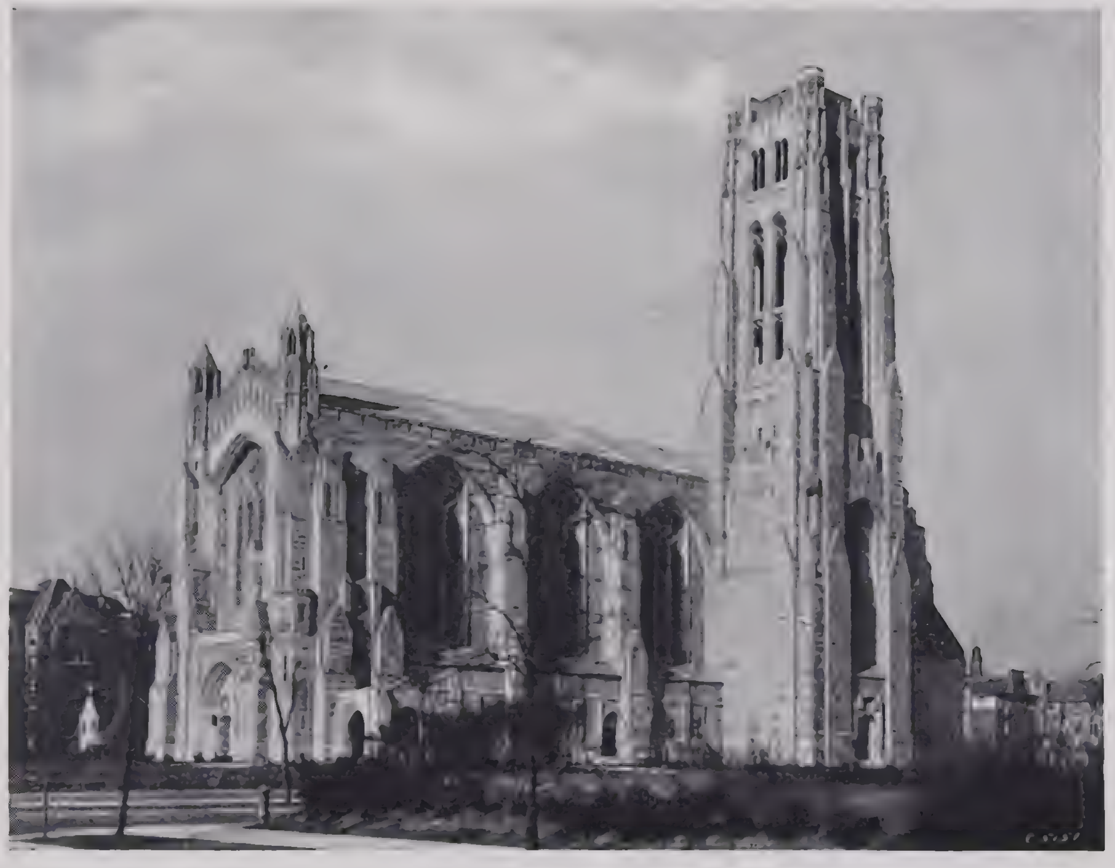
FIRST·FLOOR·PLAN· SECOND FLOOR PLAN ·THIRD·FLOOR·PLAN·

PLANS OF THE BARBARA PFEIFFER CHAPEL-MUSIC BUILDING, NORTH CENTRAL COLLEGE.
JOSEPH C. LLEWELLYN COMPANY, ARCHITECTS

THE BARBARA PFEIFFER CHAPEL-MUSIC BUILDING, NORTH CENTRAL COLLEGE.
JOSEPH C. LLEWELLYN COMPANY, ARCHITECTS

regulation auditorium and one nearly of lecture-room size is that planned as a practice trial court in the Levi Mayer School of Law Building at Northwestern.

Where an auditorium may be of restricted size as at a small college and where there is sufficient interest in dramatics, it is possible to design a building that will answer both for meetings and for play performances. At Wisconsin, however, the Bascom Theatre, seating 534, is not a separate structure but is a part of the huge academic building of the same name. The "little" or "art" theatres, so-called, rarely seat more than 500, and this capacity would probably answer at many colleges. The building then should have the requisites of a small theatre: a rectangular sloping main floor for the seating, at the rear of this a standee and entrance lobby, one balcony over the standee, a proscenium arch at least 25 feet wide with or without one or two boxes upon each side. The stage should be about 30 feet deep with ample wing space at the sides, the "gridiron" or rigging loft at least 60 feet above the stage, and ample working space between the grid and the roof; one star dressing-room at the stage level, several smaller dressing-rooms above and a dressing-room for a small chorus in the basement.



THE CHAPEL OF THE UNIVERSITY OF CHICAGO.

BERTRAM G. GOODHUE AND BERTRAM G. GOODHUE ASSOCIATES, ARCHITECTS

Complete facilities of this sort are found as a part of the Music Building at the University of Minnesota. Perhaps the best example of a university theatre as a separate structure and with the most complete modern facilities is found at Yale. It has a curtain opening 34 feet wide and 24 high. The stage is 40 feet deep from the curtain to the rear wall and is the full width of the house. The clear height from the stage floor to the grid is 75 feet. There are no fly galleries and the rigging is carried down to the stage level, where it is controlled, together with the border lights and drop scenes. The seating capacity is 250.

PROVIDENCE COLLEGE LIBRARY

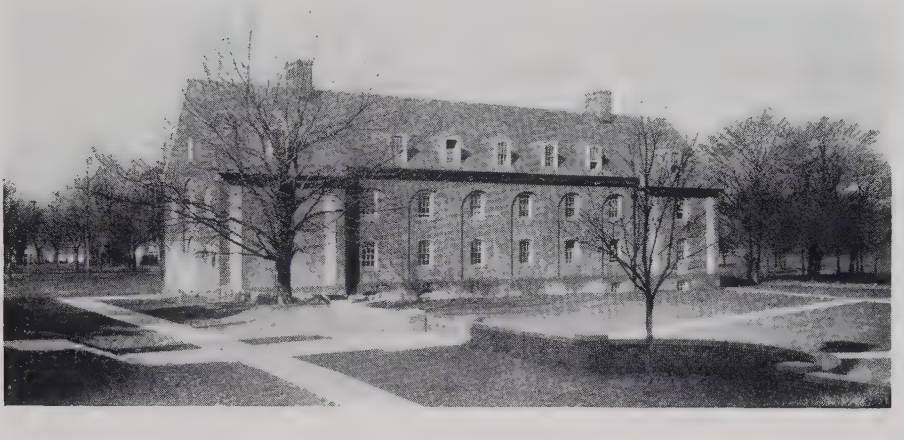
CHAPTER VII

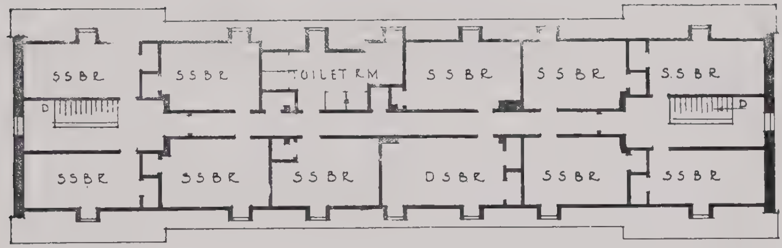
MEN'S DORMITORIES

By the word dormitory we denominate a building especially designed by an institution as a place of residence for its students and erected upon or adjacent to the campus. Few institutions are so fortunate as to have sufficient dormitories to house all their students. Lack of funds has been and remains an obstacle. Yet dormitories are a source of income, and when it is realized that when properly planned and managed they yield an annual return upon their cost, this type of building should become an attractive object for the attention of a benefactor desiring to make both an immediate and a recurring gift. Nor is this earning capacity negligible from an investment point of view. At one large eastern institution, where the income from dormitories has reached 7½ per cent, there is no difficulty in borrowing money from bankers for dormitory construction. In the West, where room rents average about $2.50 and rarely exceed $4.00 per week, the problem is more difficult.

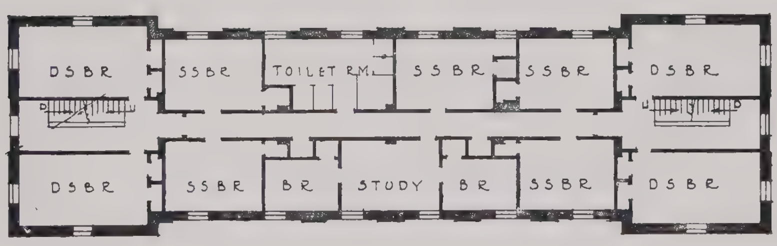
If fraternity houses supplementing the college dormitories are insufficient, boarding houses of the near-by village or town are the only recourse. Uncertain degrees of heat, cleanliness and cheerfulness are among the disadvantages of these; and there is a weakening of esprit de corps in thus separating some students from the daily life of the campus.

In depending upon fraternity houses to eke out dormitory accommodation, an administrative problem arises, for there is a tendency of students to gravitate toward the fraternity houses after the first semester, thus causing first overcrowding of the dormitories while there are vacancies in the fraternity houses, and then these conditions reversed to the disadvantage of the dormitories. This can be mitigated if not avoided by parietal rules. One in force at some institutions holds all students renting dormitory accommodation responsible for the rent for the term. If two students should take a room together and one should be required to leave, the remaining student is obliged to find a successor or else assume the entire rent of the room. Considerations such as these explain the increasing popularity of single rooms. Sometimes single rooms are made to communicate so that two congenial student neighbors may have a suite together for as long as desired.



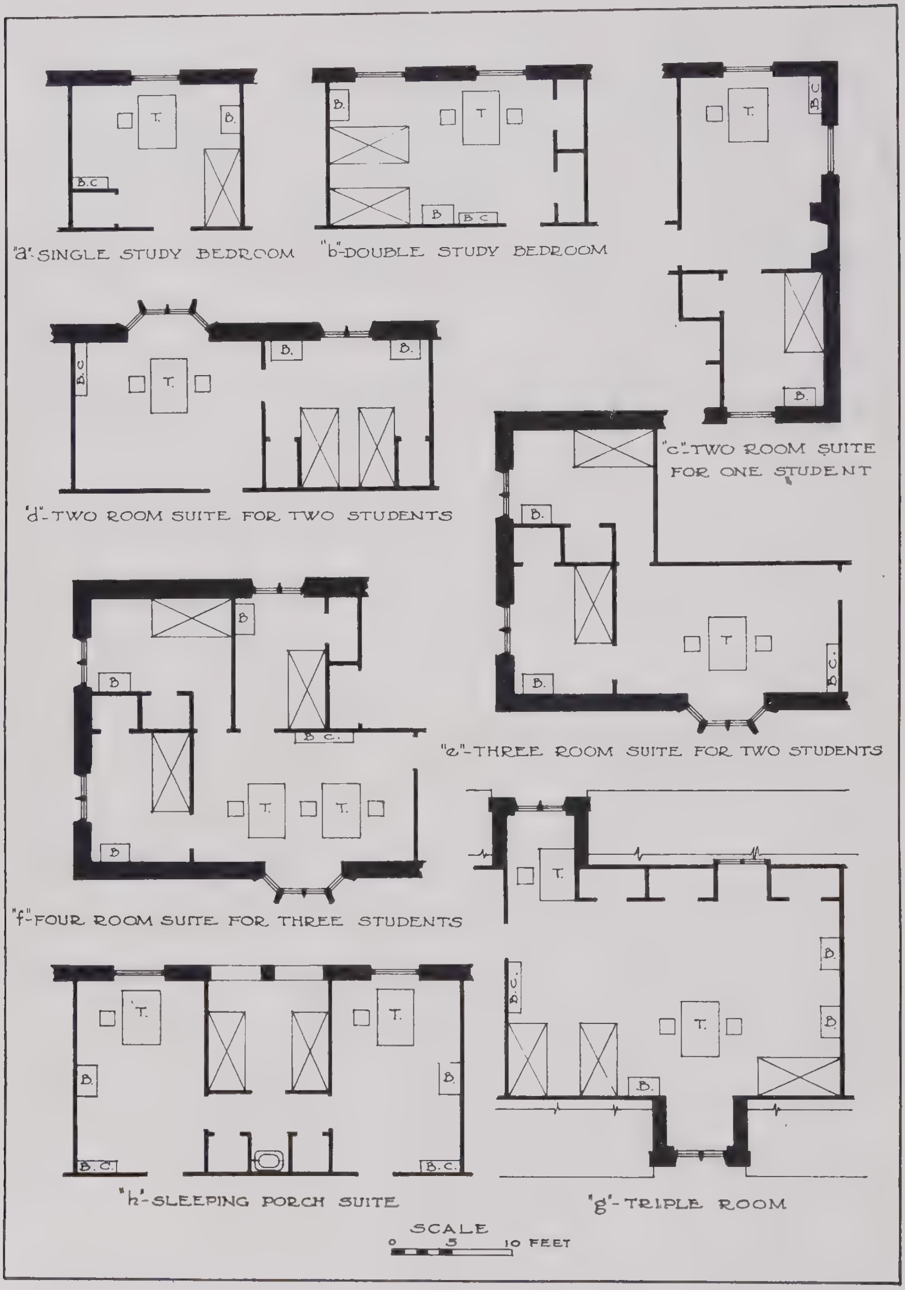


THIRD LOOR PLAN



SECOND FLOOR PLAN

DIETZ-SANTEE HALL, FRANKLIN AND MARSHALL COLLEGE



"a"-SINGLE STUDY BEDROOM

"b"-DOUBLE STUDY BEDROOM

"c"-TWO ROOM SUITE FOR ONE STUDENT

"d"-TWO ROOM SUITE FOR TWO STUDENTS

"e"-THREE ROOM SUITE FOR TWO STUDENTS

"f"-FOUR ROOM SUITE FOR THREE STUDENTS

"g"-TRIPLE ROOM

"h"-SLEEPING PORCH SUITE

TYPICAL METHODS OF ROOM ARRANGEMENT FOR DORMITORIES

A primary concern of donors and trustees is the cost of housing a student. In the experience of the writer this has ranged between $1,600 and $4,100 for first-class fireproof construction, but figures considerably below the first have been reached in localities where the climate is mild, where the buildings are not fireproof and where the student demands are modest. On the other hand, there are cases, notably at a celebrated dormitory at an eastern university, where the cost per student has greatly exceeded the highest figure above given.

By reason of the fact that dormitories are more cellular than other buildings, *i. e.*, divided into small rooms by means of many interior partitions, their cost per cubic foot is greater than that of any other type of college building, save that having elaborate technical equipment such as a laboratory. Nevertheless, an architect's skill in housing comfortably the maximum number of students will give a low cost per student even though the cost per cubic foot is increased.

The points of departure in planning a dormitory are the scale of accommodation, *i. e.*, the space to be given each student and the amount of money allotted to housing him. These two factors go hand in hand, and if one is increased the other is similarly affected. Elaboration of architectural treatment and the kind of materials used will also find their response in the cost of the building.

A student can be housed in any one of the following ways:

a. Alone in a *Single Study-Bedroom* large enough to contain a bed, a bureau, a small bookcase and a table.

b. With one other student in a *Double Study-Bedroom* large enough to duplicate the above furnishings.

c. Alone in a *Two-Room Suite for One Person*, consisting of a study and one sleeping-room, a luxurious arrangement not often provided.

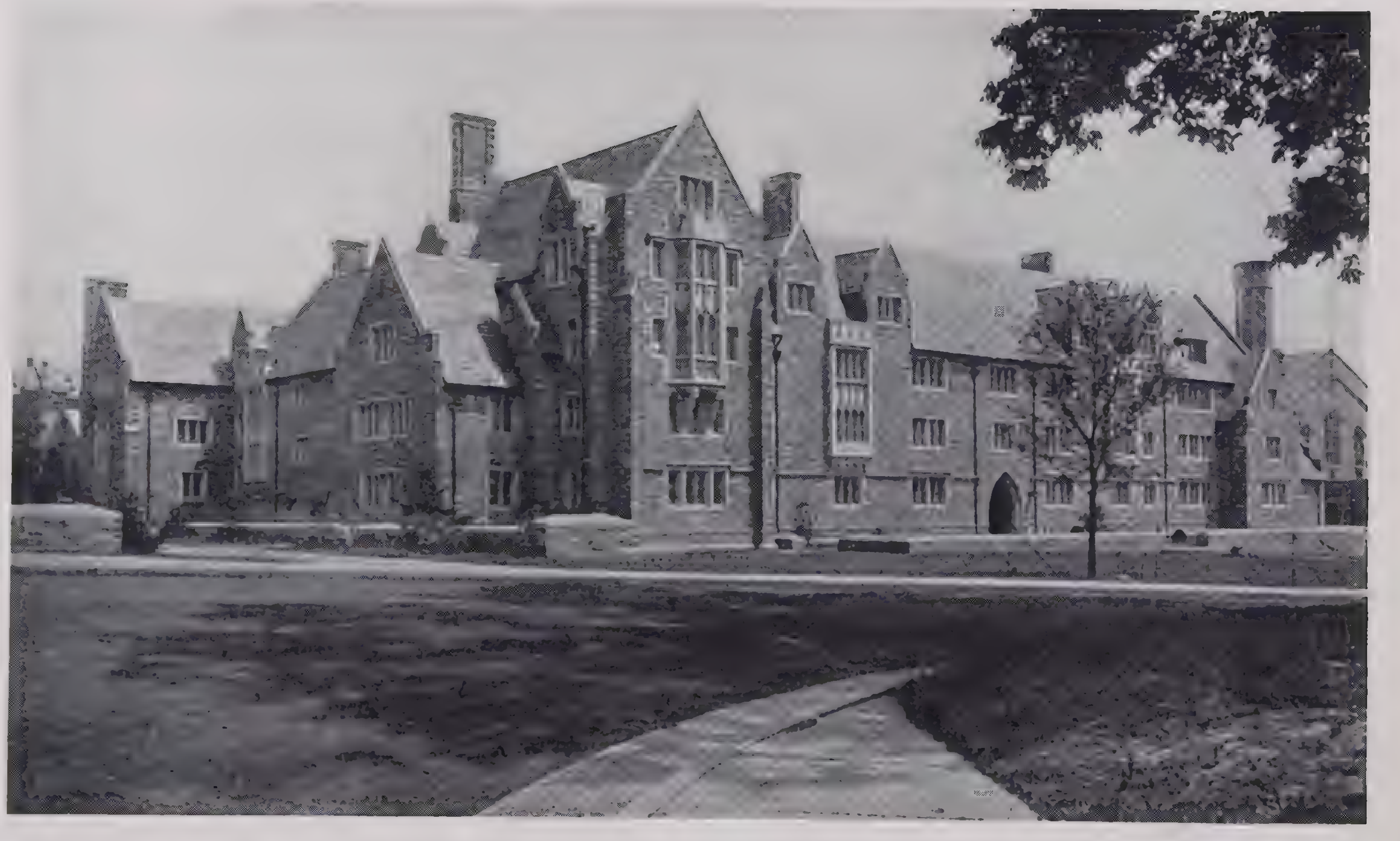
d. With one other student in a *Two-Room Suite* consisting of a study and a sleeping-room large enough for two.

e. With one other student in a *Three-Room Suite* consisting of a study used in common and two small sleeping-rooms.

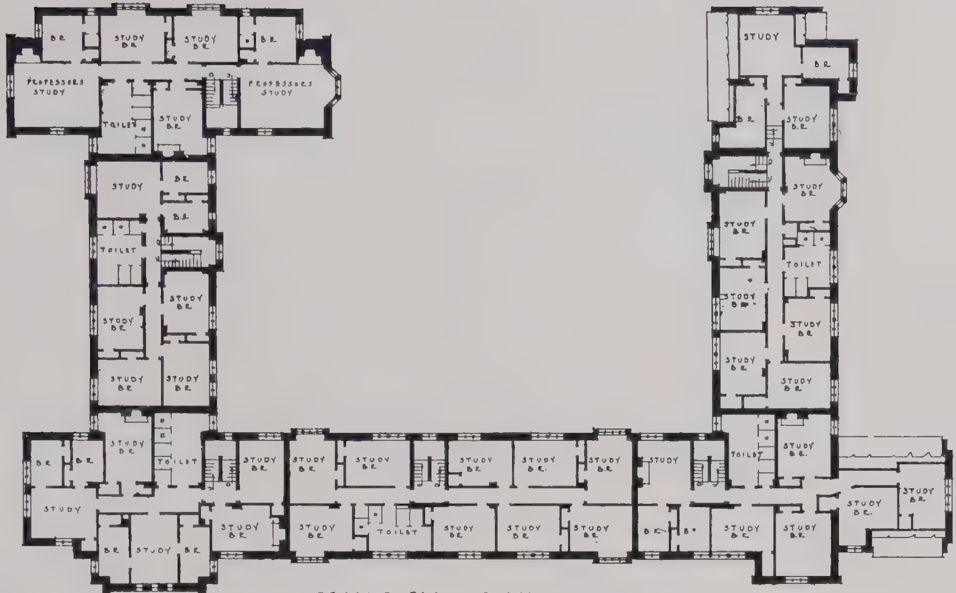
f. With two other students in a *Four-Room Suite*, an extension of "*e*" by the addition of a third sleeping-room, an arrangement rarely adopted.

g. With two other students in one large *Triple Room* such as is sometimes feasible on top floors where the roof makes difficult the division into separate rooms.

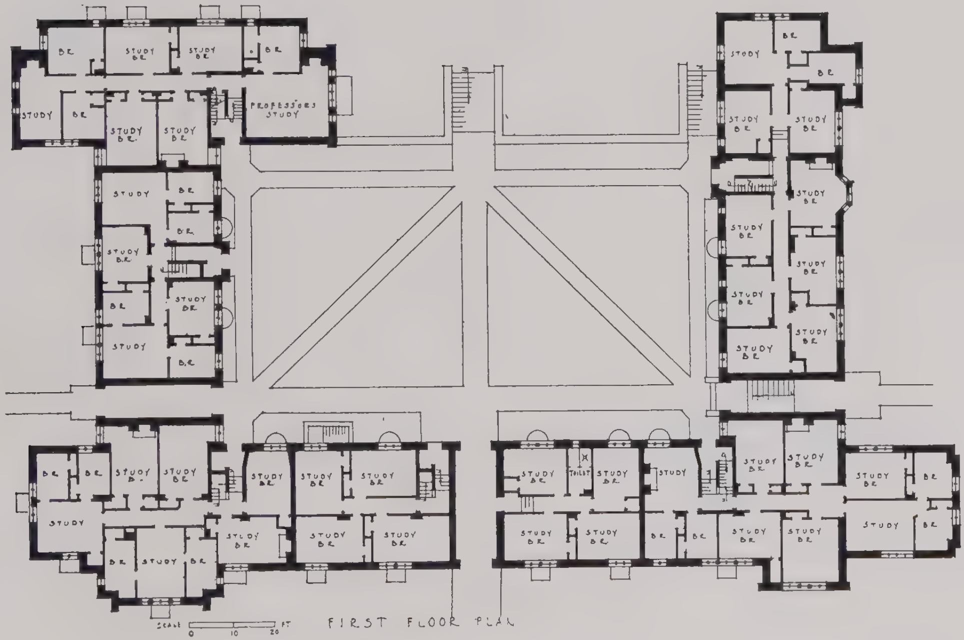
h. With one other student in a *Sleeping-Porch Suite, i. e.*, each student having his own room on either side of a sleeping porch used by both students.



PYNE HALL, PRINCETON



SECOND FLOOR PLAN



FIRST FLOOR PLAN

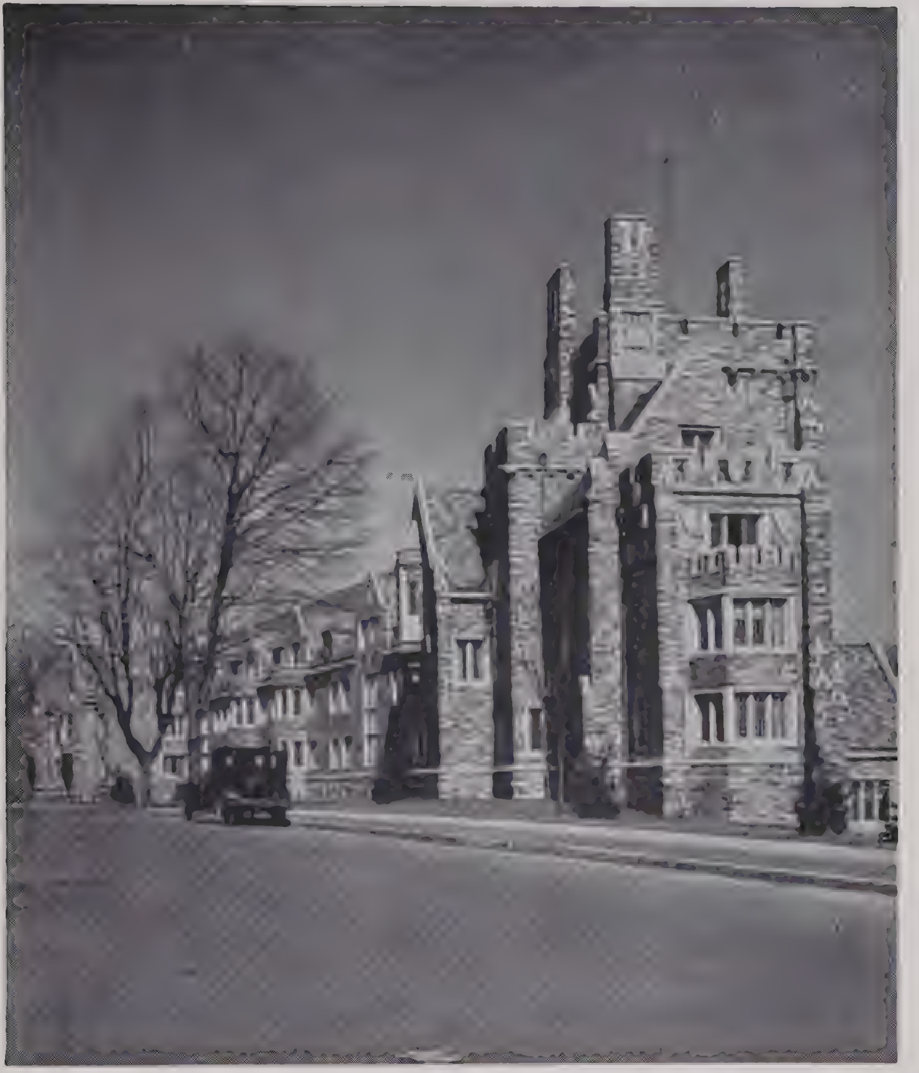
PYNE HALL: FIRST AND SECOND FLOOR PLANS

In men's dormitories a private bathroom en suite for students is too luxurious an arrangement to be considered, but it is essential to a suite which is to be occupied by a member of the faculty.

For dormitories built with the sole object of housing as many students as possible within a given appropriation, the room arrangements can well be confined to "*a*" and "*b*." Typical cases of all these and other arrangements are shown with their furniture on page 112. It will be seen that the term "sleeping porch" is really a misnomer, but is used for want of a better expression. The sleeping-room entirely open on one side and within the periphery of the building, is neither a porch nor is it a balcony or veranda. It is really a semi-outdoor room; and the fact that it is open on one side only and has the protection of walls on the remaining three sides explains possibly why it is acceptable at institutions as far north as Northampton, Mass., and Eugene, Ore.

Obviously the desirable position of any room is broadside to the exterior of the building, for this affords better lighting and ventilation and is the pleasantest arrangement. It is often necessary, however, to place rooms with their longer dimension at a right angle with the external wall. Such rooms would have one window at the narrow end and if they are of single room size with a width of about 8 feet 3 inches, their clear depth should not exceed 12 feet 6 inches or so. Otherwise they will be too deep to be well-lighted and cheerful. If the longitudinal corridor is placed off centre with the building so that the row of columns upon one side of the corridor is in the centre of the building and continues upward to support the roof ridge, it will be feasible to provide upon one side of the corridor rooms broadside to the external wall and upon the other side rooms whose narrower dimension coincides with the external wall.

Division of a dormitory into different houses, each with its own entrance by means of transverse walls, is desirable as contributing to domesticity, since a small rather than a large group is thus housed. It reduces the fire hazard in the building and is an aid to administration, especially if there are proctors over groups of about 15 men. It permits the subdivision of the building into units of moderate size for which funds for erection can be raised, the entrance of each unit being identified by the name of the donor. This arrangement becomes difficult, but not impossible, where building codes require two means of egress from a building, that is, to make it possible to escape down one stairway if fire or smoke is rising in another. This requirement demands respect, but in the case of low buildings of fireproof construction the danger to life is at a minimum. Holder Hall at Princeton was



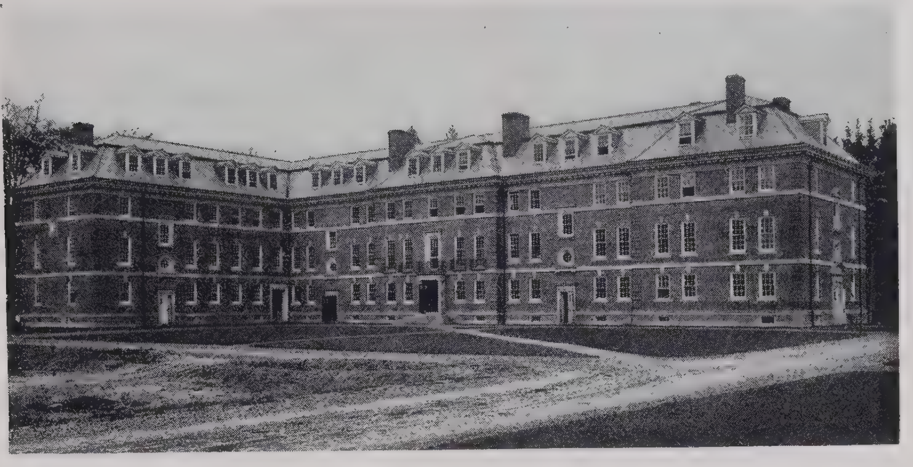
FOULKE AND HENRY HALLS, PRINCETON. ZANTZINGER, BORIE & MEDARY, ARCHITECTS built with separate entries (1909) as were also the new units at Rensselaer Polytechnic, the new men's dormitories at Louisiana State University, at Williams and at Rutgers Colleges. The method requires more stairways, for there must be one for each house; but on the other hand, a long unattractive corridor traversing a building in which there is a continuous series of rooms is avoided.

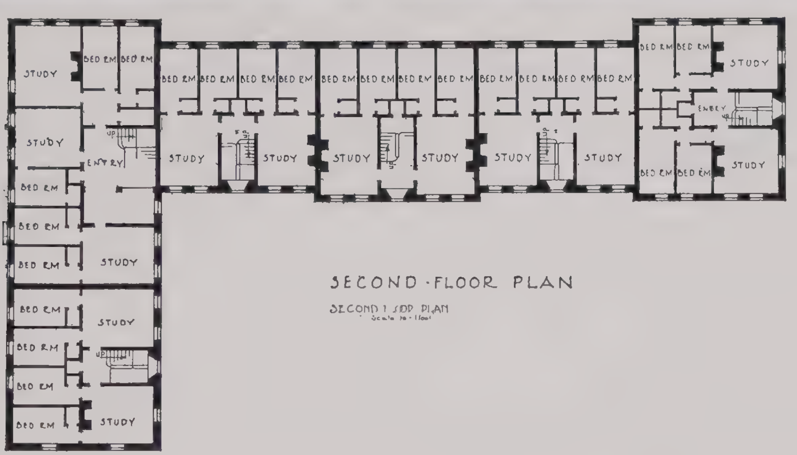
In order to gain the essentials in planning it will usually be found that the building must have a waist not exceeding 33 feet and that a plan square in shape or in that of a bulky rectangle becomes impossible for æsthetic reasons as well as for practical ones. In fact, the slender rectangle has another advantage than giving the maximum light and air. It can the more readily be joined to others like it, and at any angle to suit the lie of the land. There can be found delight and picturesqueness in such a grouping at once intimate and homelike. Additions of new units can be easily made.

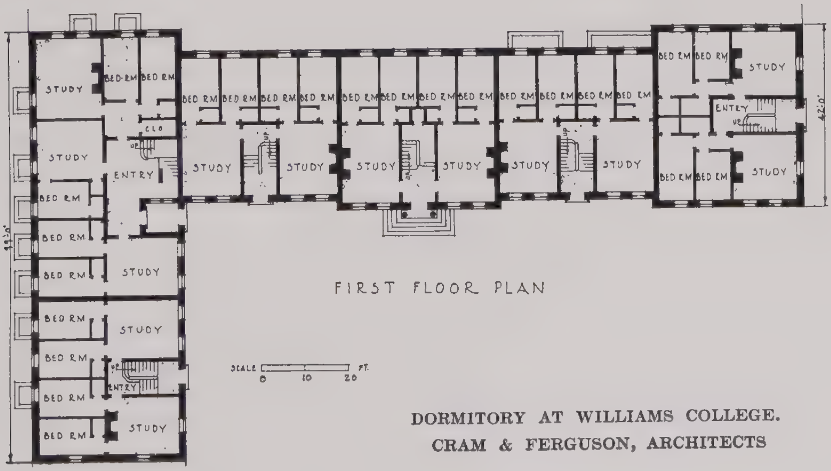
Except in large cities where land is limited, it is inadvisable to build dormitories of more than three or three and a half stories in height. If it be taken as axiomatic, as we do, that dormitories must be non-institutional in character and hence distinguished from other college buildings, several cannot be reared together in a straight row. They should turn and become like an L, U or H in shape. To have pleasant outlooks from the rooms, the view of the sky should not be shut out by high buildings near by. This should not be taken to inhibit the use of a six or even an eight-story building in the shape of a tower of dominating proportion needed as a culmination of the masses forming the architect's general composition. Northern architects who have built in the South have been severely criticised for planning entirely enclosed courtyards surrounded by dormitories four stories high, thus preventing the circulation of air necessary in the warm latitude.

In planning a building the most precious part is the periphery or exterior wall face, and a skilful architect is chary of devoting it to any but the best purposes, since from this source alone come light and air into the building. The universally recognized advantage of corner rooms is due to their having two external wall faces. Consequently it will be found generally preferable to place toilet-rooms as well as stairways in the internal angles of the building where they will have sufficient but only sufficient light and air. Projecting wings and outlying portions can then be devoted to the student rooms. (We have seen cases where an entire wing, lighted on three sides, has been given over to a single large lavatory.)

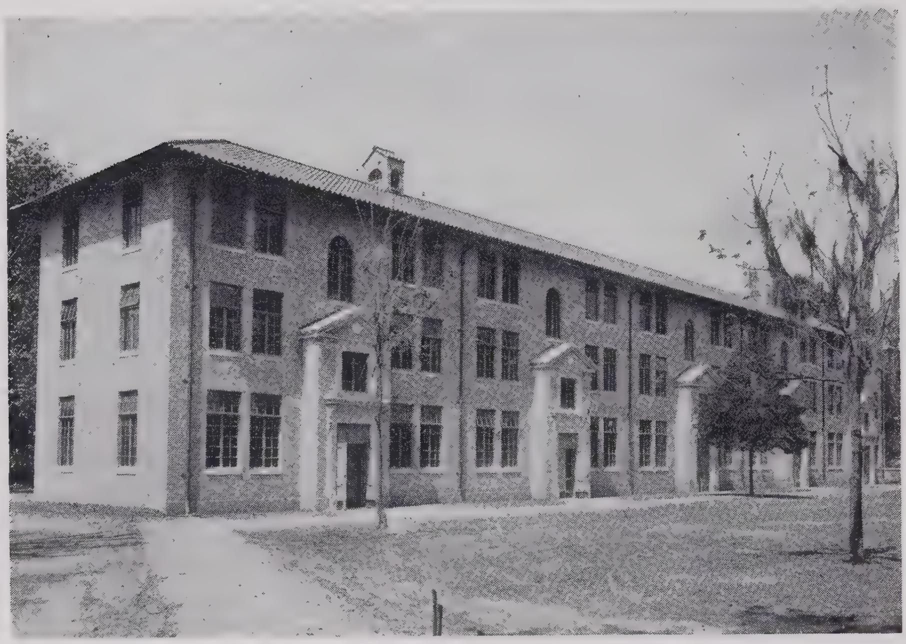
Closets should be planned with the rooms and not merely so designated because of left-over space. Their area alone does not suffice: the

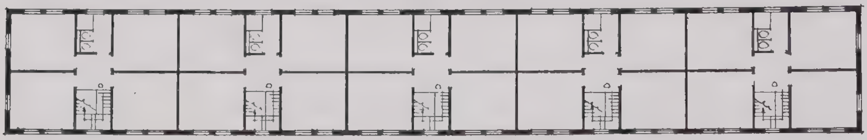




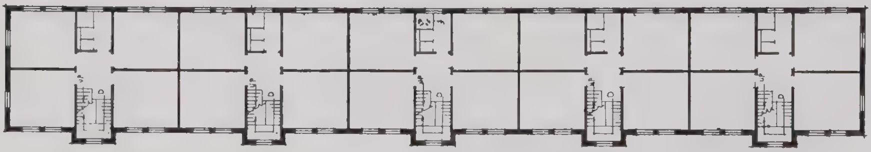


DORMITORY AT WILLIAMS COLLEGE.
CRAM & FERGUSON, ARCHITECTS

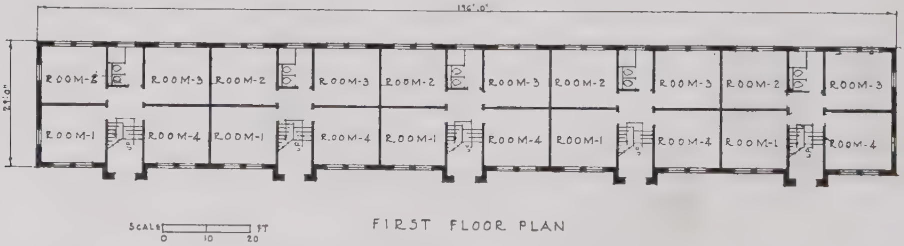




THIRD FLOOR PLAN



SECOND FLOOR PLAN



FIRST FLOOR PLAN

MEN'S DORMITORY AT LOUISIANA STATE UNIVERSITY. WOGAN & BERNARD, ARCHITECTS *shape* of the area is important. A closet should not be less than 20 inches deep and there should always be one closet for each student.

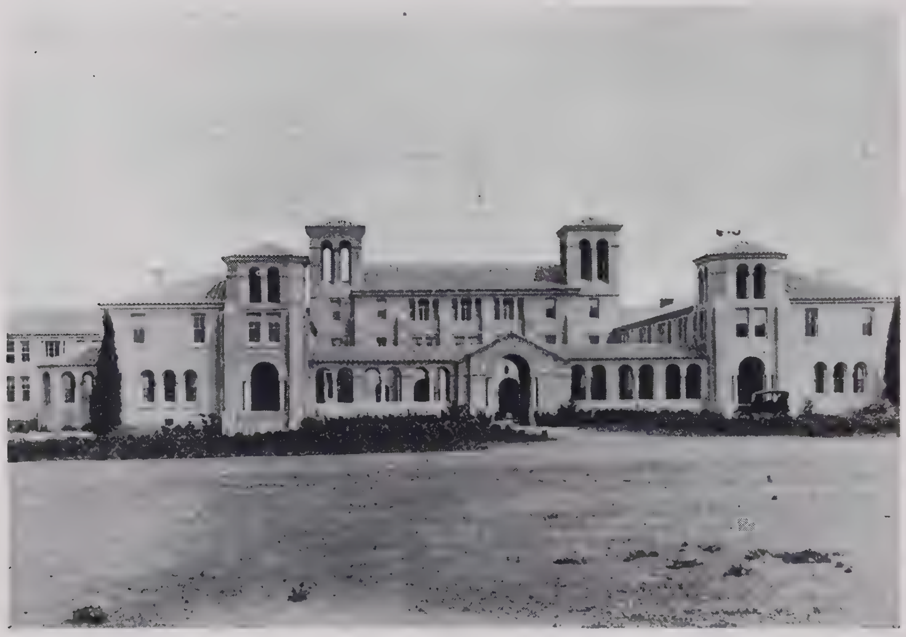
In the low building we are advocating, a trunk lift is unnecessary in men's dormitories, but if the building is more than three stories above the ground one should be provided. If the soil conditions of the site are of average dryness, trunks can be stored in the basement upon racks clear of the floor. Wherever possible an outside entrance to the basement should be provided. In damp locations trunks should be stored in the loft of the dormitory, or if this is not feasible in that of another building near by.

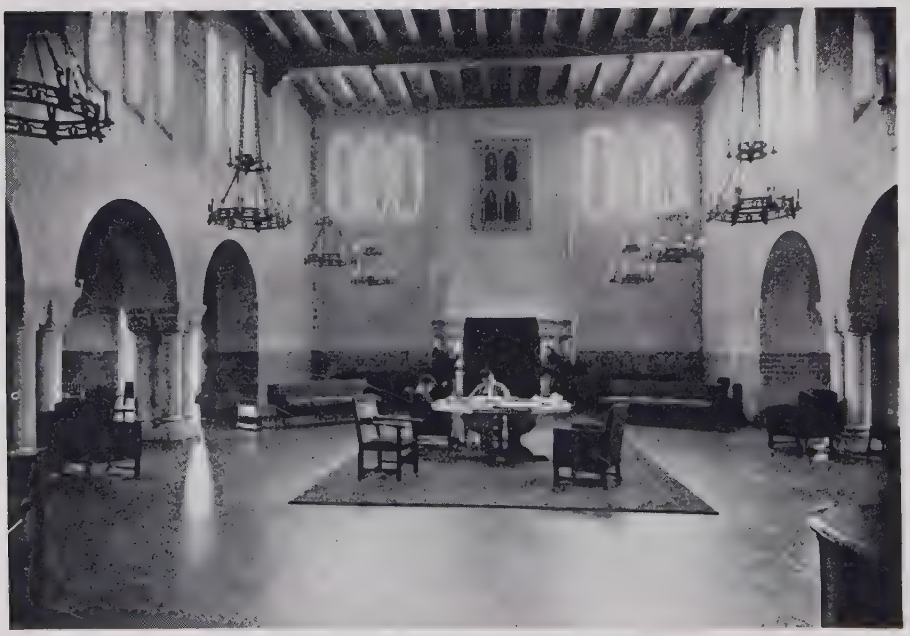
Care should be taken in planning that structural features such as columns and beams should not appear at awkward and unsightly places in the rooms. Columns can often be included in closets so as not to appear in the room at all. Beams and girders, if along the intersections of walls and ceilings, are not nearly so objectionable as if casually crossing the field of the ceiling, as is often noticed, and bearing at a seemingly accidental point over a window head. It is preferable to adopt one of the types of floor construction which provide flush ceilings, *i. e.*, the field of the ceiling in the same plane as the bottom of the structural beams. If bedrooms or studies are under a lavatory, there should be a false ceiling to cover the branchery of ugly drain pipes.

Modern dormitories contain no boilers but are heated from the central plant of the institution. Rooms used for sleeping only need not be heated.

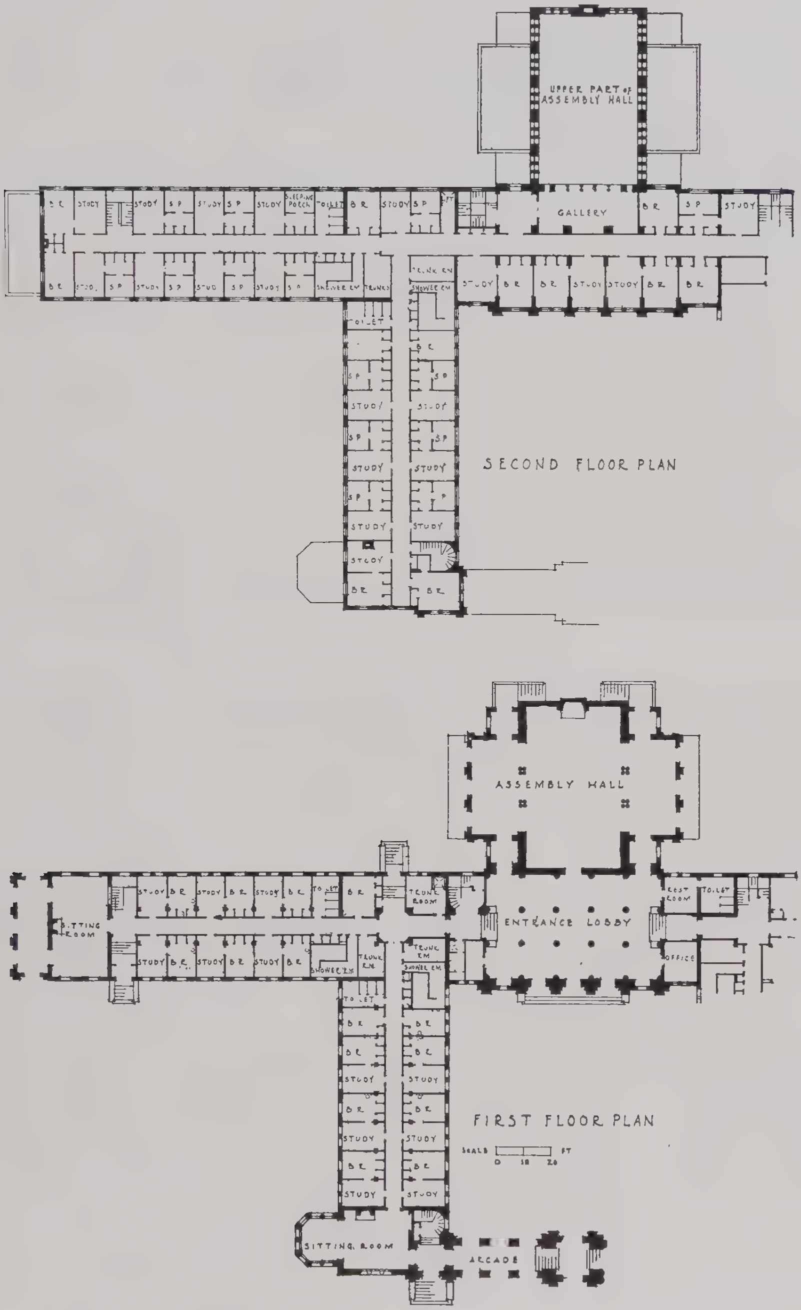
If there is any single word indicating an essential in the conception of a dormitory, it is "cheerfulness." The architect alone cannot insure this, if the building committee has decreed the building to be set in a thick grove of trees, or if trees are afterward allowed to grow so close to the walls as to cause gloom and dampness. The student feels this effect especially toward the close of day when with studies over he retreats to a lodging that must depend on electric light for its cheer.

What might be termed the minimal type of men's dormitories is found where the utmost lodging for the money expended is to be obtained. This type contains only the students' rooms, the lavatories, a linen-room and the corridors and stairways necessary for communication. It has no food service or faculty suites, nor does it provide for student activities. Examples of this type are the new men's dormitories at the University of Delaware, at Pennsylvania State College, at Franklin and Marshall College and at Brown University. The dormitory recently completed at the University of Kentucky departs from this simplest, compact type only to the extent of having a general lounge on the first floor.





TOYON HALL AT STANFORD UNIVERSITY. BAKEWELL & BROWN, ARCHITECTS



PLANS OF TOYON HALL. BAKEWELL & BROWN, ARCHITECTS

TABLE I

"SIMPLEST" TYPE OF FIREPROOF DORMITORY FOR MEN

GEORGIAN STYLE, BRICK WALLS, SLATE ROOFS

NO FOOD SERVICE, COMMON ROOMS OR FACULTY SUITES

DORMITORY	DATE	NUMBER OF MEN HOUSED	COST INCLUDING PROFESSIONAL FEES		AVERAGE NET FLOOR AREA OF ROOM TYPES EXCLUDING CLOSETS					EFFICIENCY OF PLAN WITH RESPECT TO FIRST FLOOR ONLY						STAIRWAYS	
					SINGLE STUDY BED-ROOMS	DOUBLE STUDY BED-ROOMS	STUDIES	SINGLE SLEEPING ROOMS	DOUBLE SLEEPING ROOMS	NET AREA STUDENT ROOMS & CLOSETS			TARE SEE NOTE		GROSS PLAN AREA	NO. OF STAIRS	SQ. FT. OF PLAN AREA PER STAIRWAY
			PER CU. FT.	PER MAN						MEN		%		%			
			Cts.														
Example A	1916	59	43.71	$1520.92	164.22	..	180.50	94.89	..	17	3078	64.1	1722	35.9	4800	2	1200
" B	1922	98	64.05	2026.35	181.13	234.21	..	..	..	31	3911	56.6	2995	43.4	6906	3	2302
" C	1924	42	70.32	2303.09	166.53	217.31	168.27	92.48	..	15	2196	58.6	1554	41.4	3750	2	1875
" D	1924	42	70.32	2303.09	166.53	217.31	168.27	92.48	..	15	2196	58.6	1554	41.4	3750	2	1875
" E	1925	76	67.70	1668.40	..	229.11	..	..	..	18	2276	63.7	1296	36.3	3572	2	1786
" F	1925	84	66.08	2971.00	143.69	242.43	231.24	88.49	166.65	29	5883	64.5	3239	35.5	9122	5	1822
Averages	..	..	63.69	2132.14	164.42	228.07	187.07	92.08	166.65	..	..	61.02	..	38.98	..	3.2	1810

NOTE: Tare represents plan area occupied by corridors, stairways, lavatories (toilet-rooms), porters', housemaids' and other hall closets, partitions and exterior walls.

Analytical data upon this type are given in Table I. The dates are those of breaking ground, since this takes place only a few weeks after estimates are obtained and the market conditions as of that time go far to fix the ultimate cost of the building. The floor areas given for the different types of rooms represent net usable space exclusive of the one closet invariably provided for each student. The unit cost per student housed and per cubic foot is based on the total cost of the building, including the work of the mechanical domestic engineering trades, *i. e.*, heating, plumbing and electric work and also architect's and engineers' fees, but it does not include the contingent expense usually assumed by the institution and not appearing on the architect's books, such as grading beyond contract limits, extension of steam, water and electric service lines, drives or other means of approach, movable furniture, the salary of a clerk-of-works or the travelling expenses of consultants, nor any charge in the nature of cost of the land occupied.

This type of dormitory is so simple, compact and devoid of variants, the plans consisting of one rectangle or several conjoined, that a further analysis called "Efficiency of Plan" is given. This is based in each case upon the first floor plan and shows the net usable floor space devoted to each student *on that floor*, *i. e.*, his room or rooms and his closet. The ratio of additional plan area in order to provide corridors, stairways, lavatories, porters' closets, partitions and exterior walls is then given in the column entitled "Tare." The Gross Plan Area is the entire area of the first floor plan within the external periphery of the outside walls.

If a certain plot of ground is proposed for a dormitory and a certain expenditure contemplated, it can be learned from this table how many men can be housed by a given room arrangement. Dividing by the number of stories contemplated (usually three), the number of men housed on the first floor is found. Multiplying this by the unit of space they require in the adopted room arrangement and adding to this the tare, the over-all area of the first floor is ascertained and the proposed site discovered to be of adequate size or not.

The slightest variation of plan in the direction of increased space, however devised, is reflected in the tare. It is an overhead to the space occupancy of each student. A lobby or alcove, wider halls, a small storeroom increases this overhead ratio, but it is by no means to be inferred that the advantages gained are not worth the slight additional expense, nor is it intended that the cold-blooded phrase "efficiency of plan" should be a measure of an architect's success or failure in designing his building.

TABLE II

"SEPARATE HOUSE" TYPE OF FIREPROOF DORMITORY FOR MEN

Characteristics the Same as in Table I Save for the Division

into smaller "houses" each with its stairway serving about 4 rooms on each story

DORMITORY	DATE	NUMBER OF MEN HOUSED	COST INCLUDING PROFESSIONAL FEES		AVERAGE NET FLOOR AREA OF ROOM TYPES EXCLUDING CLOSETS					EFFICIENCY OF PLAN WITH RESPECT TO FIRST FLOOR ONLY						STAIRWAYS	
			PER CU. FT.	PER MAN	SINGLE STUDY BED-ROOMS	DOUBLE STUDY BED-ROOMS	STUDIES	SINGLE SLEEPING ROOMS	DOUBLE SLEEPING ROOMS	NET AREA STUDENT ROOMS & CLOSETS			TARE SEE NOTE		GROSS PLAN AREA	NO. OF STAIRS	SQ. FT. OF PLAN AREA PER STAIRWAY
										MEN		%		%			
Example G	1923	12	$1.30	$4333.33	..	..	221	95.10	..	4	861	69.4	380	30.6	1241	1	1241
" H	1925	120	43.80 Cts.	827.04	..	197.28	..	..	..	20	3948	67.5	1900	32.5	5848	5	1170
" I	1926	91	64.77 Cts.	2351.65	156.22	208.90	..	..	..	33	5306	69.8	2302	30.2	7608	6	1238
Averages	..	..	79.52 Cts.	2504.01	..	203.09	..	..	..	..	..	68.9	..	31.1	..	4	1216

Note: Tare represents plan area occupied by corridors, stairways, lavatories (toilet-rooms), porters', housemaids' and other hall closets, partitions and exterior walls.

The dormitories considered in Table II are similar to those of Table I in so far as style of architecture, compactness, absence of features extraneous to lodgment and the materials of construction are concerned, but they represent the grouping of rooms into separate and independent houses, each with its own stairway. There is an average of 1,216 square feet of plan area to a stairway in these dormitories as compared with 1,810 square feet in those of Table I. We have already mentioned the frequency of stairs and the absence of longitudinal corridors in this type of plan. The net effect is shown by the ratio of tare, but the average of 31.1 per cent should be slightly higher because the three-story Example I has all toilet-rooms on the second floor and hence the first floor displays itself favorably for its net amount of usable space.

Although this type of dormitory has the advantages already pointed out, let no one suppose it is economical to erect one or two of the separate houses at a time. The cost per cubic foot rises sharply when the building operation consists of one unit only 36 feet long, as Example G indicates, where there are but four men on each of the three floors. Better erect a number of the small houses at a time. The low cost of Example H is explained by its being of reinforced concrete frame construction with an almost complete repetition of all units as to dimensions, design and materials.

The next type of men's dormitories to be considered is analyzed in Table III. While the space allotted to each man is but slightly more than that in the examples in Tables I and II, there is a freedom of planning which has escaped the confines of a single rectangle. Increase of accommodation is, of course, obtainable in any style of architecture, but it happens that these dormitories are in the Gothic style and hence there is variety of massing and outline. A broad open archway or slype with ornamented portals pierces Building "K" and there are many external steps. There is a portion of the plan set at diagonals with the remainder and several storied bay windows in Building "J." Example "K" is more richly ornamented than "J." The attenuated plan reduces the proportion of plan area to periphery and tends to increase unit cost. There is also a greater amount of diversified detail and exterior ornament. It is interesting to observe how these things affect the cost per cubic foot and per man and the increased percentage of plan area or tare devoted to other purposes than student lodgment. The small size of these dormitories has undoubtedly been another factor in raising their cost per cubic foot.

Dormitories set forth in Table IV have much the same characteristics as those of Table III, but accommodation is increased by the

TABLE III

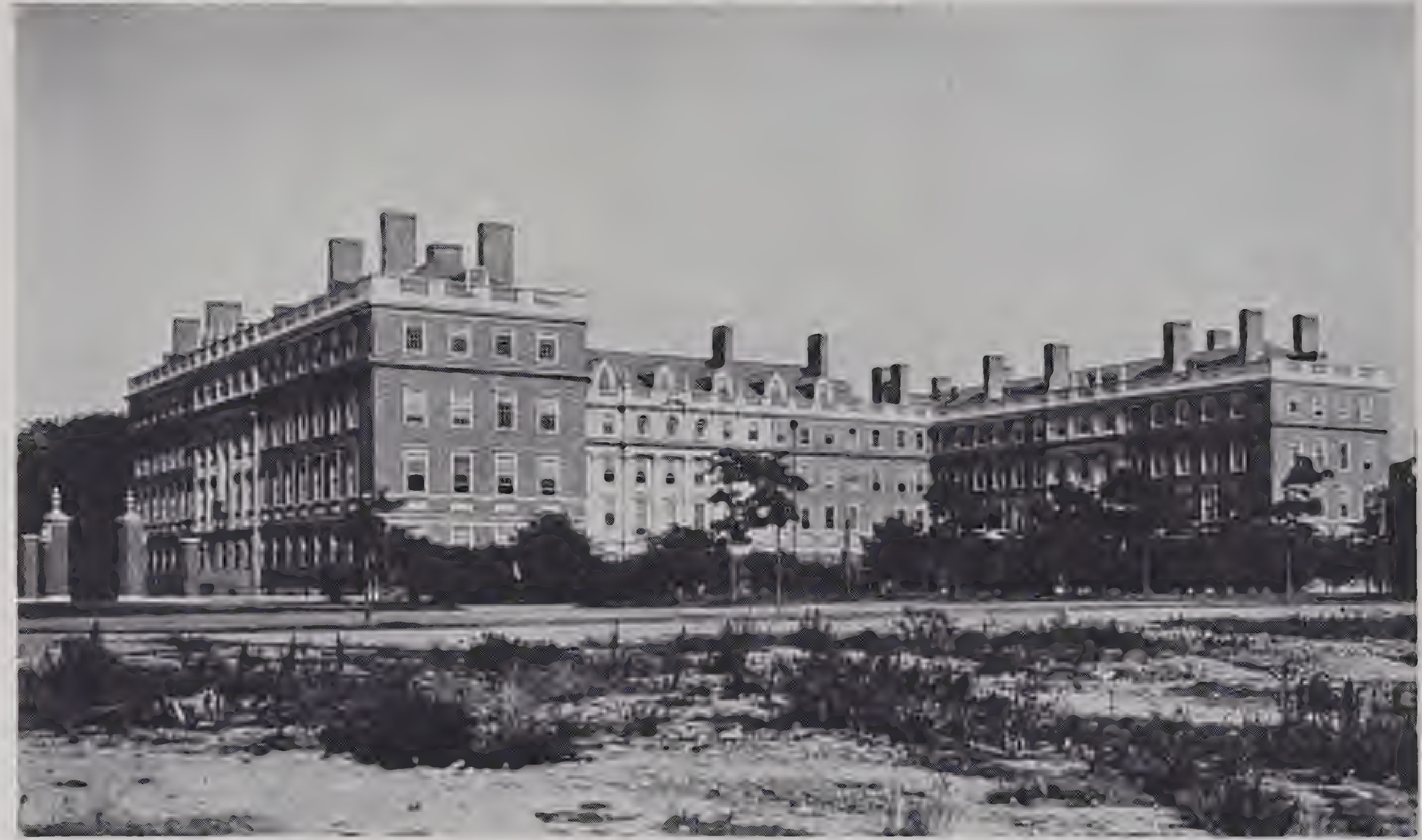
INTERMEDIATE TYPE OF FIREPROOF DORMITORY FOR MEN

Gothic Style, Stone Walls, Slate Roofs

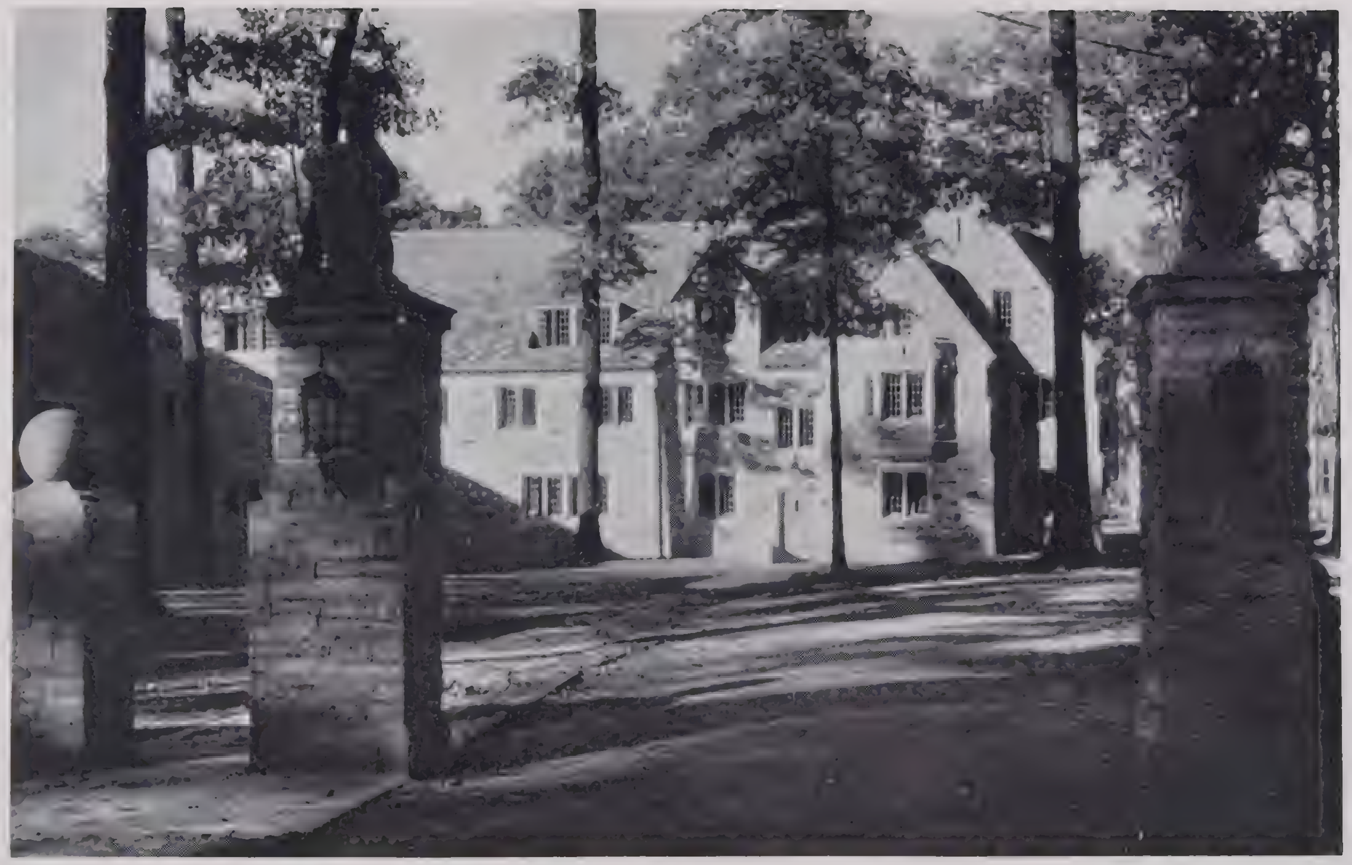
NO FOOD SERVICE, COMMON ROOMS OR FACULTY SUITES

DORMITORY	DATE	NUMBER OF MEN HOUSED	COST INCLUDING PROFESSIONAL FEES		AVERAGE NET FLOOR AREA OF ROOM TYPES EXCLUDING CLOSETS					EFFICIENCY OF PLAN (WITH RESPECT TO FIRST FLOOR)						STAIRWAYS	
										NET AREA STUDENTS' ROOMS & CLOSETS			TARE SEE NOTE		GROSS PLAN AREA		
			CU. FT.	PER MAN	SINGLE STUDY BED-ROOMS	DOUBLE STUDY BED-ROOMS	STUDIES	SINGLE SLEEP-ING ROOMS	. .	NO. OF MEN	SQ. FT.	%	SQ. FT.	%		NO. OF STAIRS	SQ. FT. OF PLAN AREA PER STAIR-WAY
			Cts.		Sq. Ft.	Sq. Ft.	Sq. Ft.	Sq. Ft.									
Example J	1922	63	94	$2718.58	150	217	157	89	. .	18	2702	60	1781	40	4483	2	2241
" K	1927	68	98	4096.53	176	. .	206	94	. .	20	3815	54	3254	46	7069	4	1767
Averages	. .	. .	96	3407.55	163	. .	181.5	91.5	. .	. .	. .	57	. .	43	. .	3	2004

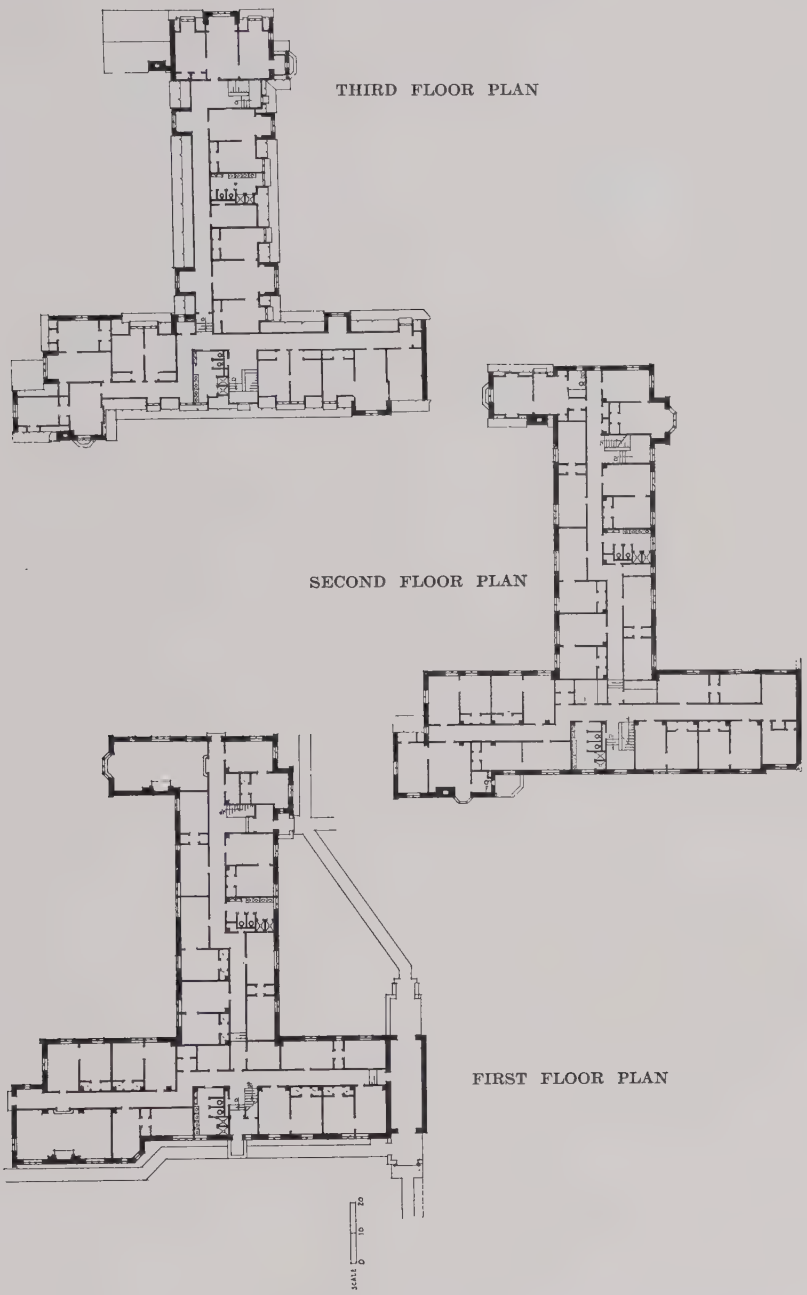
Note: Tare represents plan area occupied by corridors, stairways, lavatories (toilet-rooms), porters', housemaids' and other hall closets, partitions and exterior walls.



GORE HALL, ONE OF THE FRESHMAN DORMITORIES AT HARVARD. COOLIDGE, SHEPLEY, BULFINCH & ABBOTT, ARCHITECTS



ROBB AND CALVIN HALLS AT SOUTHWESTERN UNIVERSITY. HENRY C. HIBBS, ARCHITECT



FIRST, SECOND, AND THIRD FLOOR PLANS OF ROBB AND CALVIN HALLS AT SOUTHWESTERN

TABLE IV

A MORE ELABORATE TYPE OF FIREPROOF DORMITORY FOR MEN

With Faculty Suites

GOTHIC STYLE, STONE WALLS, SLATE ROOFS—NO FOOD SERVICE OR COMMON ROOMS

DORMITORY	DATE	NO. OF MEN	COST INCLUDING PROFESSIONAL FEES		AVERAGE NET AREA OF ROOM TYPES (EXCLUDING CLOSETS)					FACULTY ACCOMMODATIONS		EFFICIENCY OF PLAN (WITH RESPECT TO FIRST FLOOR)						STAIRWAYS	
			CU. FT.	PER MAN	SINGLE STUDY BED-ROOMS	DOUBLE STUDY BED-ROOMS	STUDIES	SINGLE SLEEPING-ROOMS	DOUBLE SLEEPING-ROOMS	SUITES OF 2 ROOMS BATH & CLOSET		NET AREA STUDENTS' ROOMS & CLOSETS			TARE SEE NOTE SQ. FT.	%	GROSS PLAN AREA	NO. OF STAIRS	SQ. FT. OF PLAN AREA PER STAIRWAY
										NO.	SQ. FT.	NO. OF MEN	SQ. FT.	%					
Example L	1921	158	Cts. 84.88	$3219.87	Sq. Ft. 168	Sq. Ft. 279	Sq. Ft. 201	Sq. Ft. 91	..	5	2356	47	8442	58.8	5913	41.2	14355	6	2392
" *M	1923	83	83.54	3843.30	170	..	206	95	..	1	441	26	4925	58.6	3482	41.4	8407	3	2802
" N	1923	92	83.54	3843.30	176.35	..	209	93	..	2	981	28	5584	60	3700	40	9284	3	3095
" O	1924	149	85.18	3758.08	173	249	201	91	160	1	353	53	9424	57	7138	43	16562	6	2760
" P	1925	66	63.00	2540.70	128.43	..	158.83	118.25	133.84	2	765.50	24	3560	46	4256	54	7816	2	3908
Averages	..	..	80.03	3441.05	163.16	264	195.17	97.65	146.92	..	..	..	..	56.08	..	43.92	..	4	2991

* M and N adjoin each other and both were erected at the same time under one contract.

Note: Tare represents plan area occupied by corridors, stairways, lavatories (toilet-rooms), porters', housemaids' and other hall closets, partitions and exterior walls.

inclusion of suites for resident unmarried members of the faculty. The area of these suites is included in the tare. Examples L, M, N and O are at a large eastern university. Example P is in the Mississippi Valley.

The next step toward increased facilities is the inclusion of a common room or lounge, a library and rooms for billiard or pool or other recreations. Fine examples of common rooms are to be found in Toyon Hall at Stanford, Proctor Hall at Princeton and in some of the dormitories at Harvard.

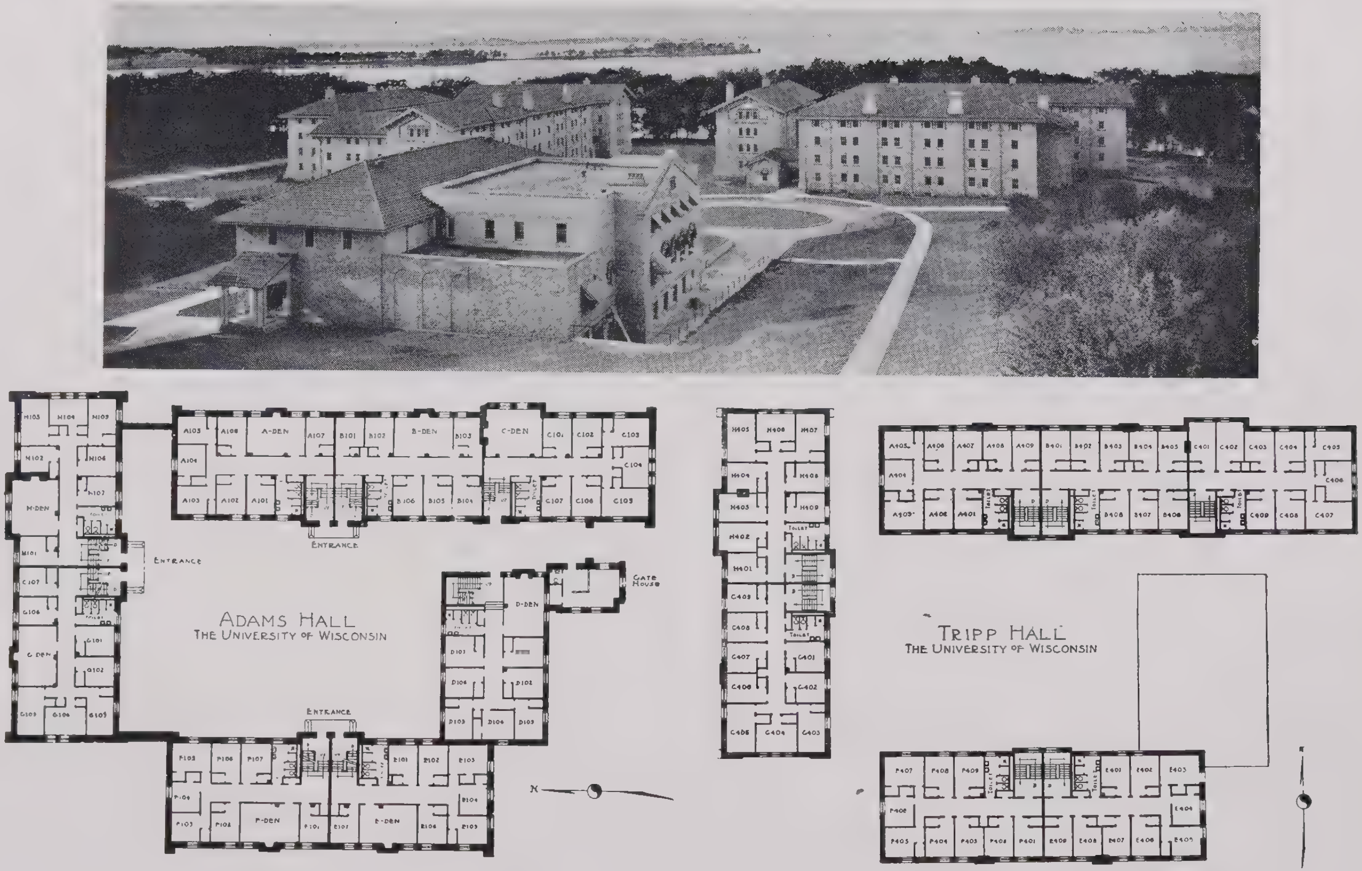
A last stage of completeness is marked by the inclusion of a commons, a kitchen and food service and appurtenances as at the Graduate College, Princeton, the Freshman Dormitories at Harvard and the Lawyers' Club and Dormitory at the University of Michigan, the dormitory portion of which is of the separate house or subdivided type.

The concentration of plumbing in general toilet-rooms is recommended with the different fixtures proportioned to the number of students housed. It is not always necessary to place one toilet-room on each floor. Three-story buildings may have them only in the second. In the case of small dormitory units built on hillsides and where there are rooms in that part of the basement having a full exterior wall, it is a step toward economy to have a toilet-room on the first floor and one on the second. Students from the basement go to the floor above to reach the toilet-room and those from the second-and-a-half or third floor go to the floor below. Large dormitories must have many more toilet-rooms; but nevertheless, it is feasible and economical to avoid unduly dispersing them.

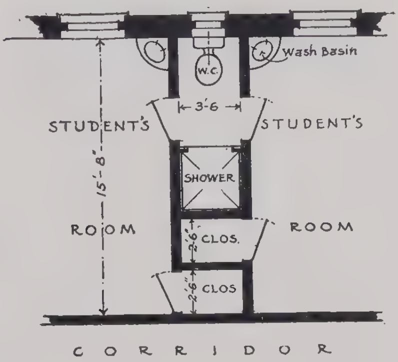
The ratio of toilet-room space and of plumbing fixtures to the number of occupants is important, and the superintendent of buildings of the institution and the architect should deliberate on this subject. If there are dormitories already in operation at the institution, the count of occupants and fixtures should be made and approval obtained.

Adjoining or near a general toilet-room and entered from the corridor there should be a housemaid's or porter's sink within a space large enough to take brooms and a few other utensils. One sink to about 3,000 square feet of floor is sufficient.

It is customary at some institutions to have wash basins in each room. This is doubtless a convenience to the occupants of the rooms and avoids congestion in the toilet-rooms, but from an economic and administrative point of view it has serious disadvantages. It necessitates a higher initial outlay for a greater number of fixtures than would be needed if placed in general toilet-rooms; it requires many stacks of soil pipe throughout the building, and it renders the over-



ADAMS AND TRIPP HALLS AT WISCONSIN (REFECTORY BUILDING IN FOREGROUND). ARTHUR S. PEABODY, ARCHITECT sight and repair of the fixtures difficult and costly. From the point of view of planning alone, toilet facilities in connection with rooms can be provided with fair economy of space if arranged as in the diagram below.



Bathing facilities have been much simplified by the popularity of the shower bath, but it is well to provide one or two tubs. There is a marked tendency toward gang showers, with resultant saving of space and the cost of marble partitions. Yet shower baths present troublesome problems. Not only must leakage be prevented by waterproofing the floor of the room containing them, but the floor of each stall must be insulated with sheet lead. The jointing of the wall material must be permanently tight. Ventilation must be provided and drafts avoided.

In the new John Jay Hall at Columbia the toilet facilities typical of each floor consist of a shower-room, about 8 x 11 feet, entirely free of partitions, accommodating seven men and containing no other plumbing save a urinal. About one-third the room not occupied by the shower-heads, is a towelling space. In a corresponding position at the other end of the building is a general toilet-room containing w. c.'s, one urinal and one wash basin.

Wash basins should be in open ranges, w. c.'s in cubicles separated by marble or steel partitions, and the room wainscoted with marble up to a height of 6 feet 6 inches; but no marble should be attached to walls made sloping by the roofs. Hot water systems should be freely circulating. If made so, mixing cocks in showers are unnecessary, as there is an immediate response to the hot water faucet, and a person can always quickly control the flow of hot water without danger of scalding himself.

The number of plumbing fixtures to occupants in typical dormitories is given in the following table:

PLUMBING FIXTURES IN MEN'S DORMITORIES

EX.	NO. OF MEN HOUSED	NO. OF TOILET-ROOMS	TOTAL TOILET-ROOM AREA	PLUMBING FIXTURES					
				SHOWERS	TUBS	BASINS	W. C.'S	URINALS	H. M. S.'S
A	59	5	708.50	10	..	20	10	5	5
B	98	7	1,565.63	18	..	28	20	..	7
C	42	3	586.71	6	3	9	6	..	3
D	42	3	586.71	6	3	9	6	..	3
E	76	6	1,022.38	16	..	16	16	..	4
F	84	16	1,724.77	18	..	20	20	..	9
G	12	3	237.88	3	..	6	3	..	1
H	120	15	1,078.00	15	..	30	30	..	..
I	91	6	982.62	18	..	24	18	..	6
J	63	8	872.84	13	..	17	14	..	7
K	68	10	1,137.08	16	..	19	19	..	8
L	158	14	1,988.00	24	..	27	25	..	12
M	83	7	1,135.37	14	..	20	16	..	3
N	94	9	1,373.31	19	..	26	19	..	4
O	149	13	2,106.93	35	..	41	37	..	12
P	66	6	893.43	12	..	24	12	12	6
Average Number of Men per Fixture....................				5.4	217.5	3.8	4.8		..

NOTE: The number of occupants are the students housed, and the private toilet-rooms of faculty suites are not included in the table. Housemaids' sinks should be proportioned to floor area rather than to the number of occupants of the building.

CHAPTER VIII

WOMEN'S DORMITORIES

A DORMITORY of the simplest type for women must have features peculiarly its own. It must have several important rooms for purposes other than lodgment, for it is more nearly a home than is a men's dormitory. These features and rooms are the following:

> A vehicle approach to within a few feet of the entrance. If the building faces directly upon the campus, where driveways should be prohibited, it may be arranged that automobiles can reach a rear or side doorway.
>
> A suitable alcove or similar space for an attendant immediately inside the main entrance. Near this a telephone booth with buzzer signals to each room.
>
> An attractive common room of generous dimensions in which social functions or small dances can be given. It should have a fireplace of liberal size.
>
> One suite for the "house mother," or as a person especially employed for this purpose, or as a resident member of the faculty in this rôle is sometimes called, a "house matron" or "house chaperon" or "resident warden." The parlor or sitting-room of her suite should open directly upon the common room, and by means of another door, if possible, it should be entered from the hall or corridor. A bedroom with a generous closet and a private bathroom complete her suite.
>
> A small reception-room or parlor near the main entrance of the building, entered from the hall or corridor and, if not adjoining, at least near the common room and house mother's suite.
>
> A kitchenette should be located near the centre of the building, accessible to the greatest number of student occupants.
>
> A small laundry for light work should be provided in the basement for the use of the students.
>
> There should be a trunk lift and outside basement entrance, whether trunks are stored in the basement of the dormitory or elsewhere.

However simple, compact and economical the dormitory, these things must be provided. They are found in the buildings of Table V,

TABLE V

"SIMPLEST" TYPE OF FIREPROOF DORMITORY FOR GIRLS

Georgian Style, Brick Walls, Slate Roofs, No Food Service

DORMITORY	DATE		COST INCLUDING PROFESSIONAL FEES		AVERAGE NET FLOOR AREA OF ROOM TYPES EXCLUDING CLOSETS		AREAS OF OTHER THAN STUDENTS' ROOMS		EFFICIENCY OF PLAN WITH RESPECT TO FIRST FLOOR ONLY						STAIRWAYS	
			PER CU. FT.	PER STUDENT	SINGLE STUDY BED-ROOM	DOUBLE STUDY BED-ROOM	COM-MON ROOM	MA-TRON'S SUITE	NET AREA OF STUDENTS' ROOMS AND CLOSETS, COMMON RM. AND MATRON'S SUITE			TARE SEE NOTE		GROSS PLAN AREA	NO. OF STAIRS	SQ. FT. OF PLAN AREA PER STAIR-WAY
											%		%			
			Cts.		Ft.	Ft										
Example Q	1917	65	63.12	$1835.19	98.98	174.19	784.0	264.27	12	2828.67	58.4	2014.33	41.6	4841	2	2420.5
" R	1925	66	75.71	2168.18	92.52	167.63	796.0	375.20	12	2939.00	60.7	1902.0	39.3	4841	2	2420.5

Note: Tare represents plan area occupied by corridors, stairways, lavatories (toilet-rooms), porters', housemaids' and other hall closets, partitions and exterior walls.

which may be taken as the minimal type of dormitory for women. These are indeed of the same architectural style and form and are at the same institution and have been designed by the same architect as Example A of the men's dormitories of Table I. The materials are almost exactly the same in both. The rooms devoted to other than student uses increase the cost of housing each student although they do not, perforce, affect the cost of the building per cubic foot. In order to make a better showing and a true one as well in the unit cost of housing students, two students are often assumed for each faculty suite consisting of two rooms and bath. That practice is quite justifiable, but for the sake of uniformity and clarity, it is not followed in this volume, the cost of the building being divided in each case by the actual number of students occupying student rooms as indicated by the plans.

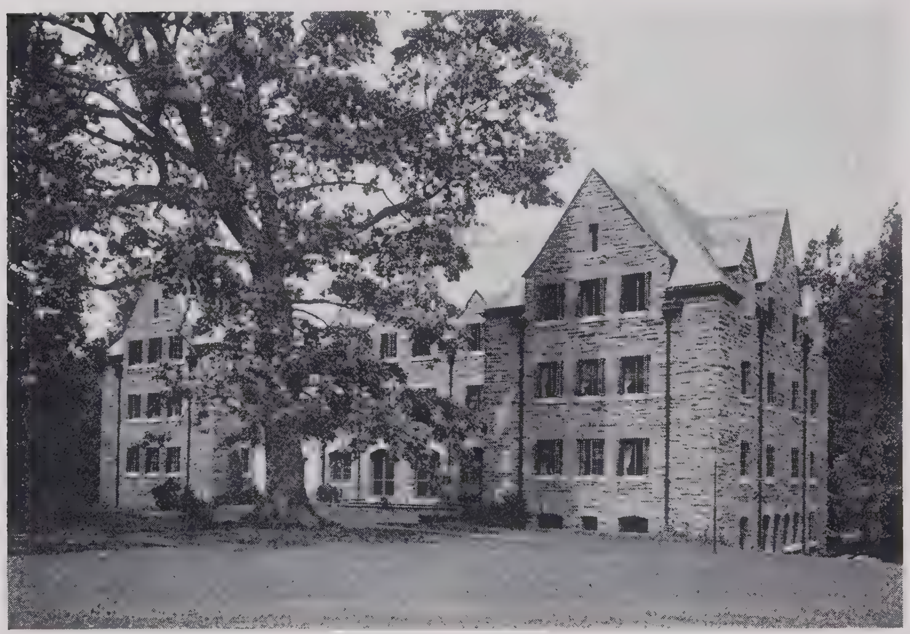
The facilities in women's dormitories are so varied that the close analysis, in the foregoing tables applying to men's dormitories, would be of little use. Hence we abandon this scrutiny as the women's dormitories become more elaborate. With a view, however, to assisting in planning, we give a few tables of Proportional Areas of as many dormitories. These tables ignore that portion of the plan area represented by stairs, elevators, corridors, vestibule, walls and partitions, etc., comprising the tare named in the earlier tables, but they show the ratio of space needed for common rooms, parlors and faculty suites as compared with the number of students and also the percentage of total finished room space devoted to the various purposes.

PROPORTIONAL AREAS—EXAMPLES "Q" AND "R"

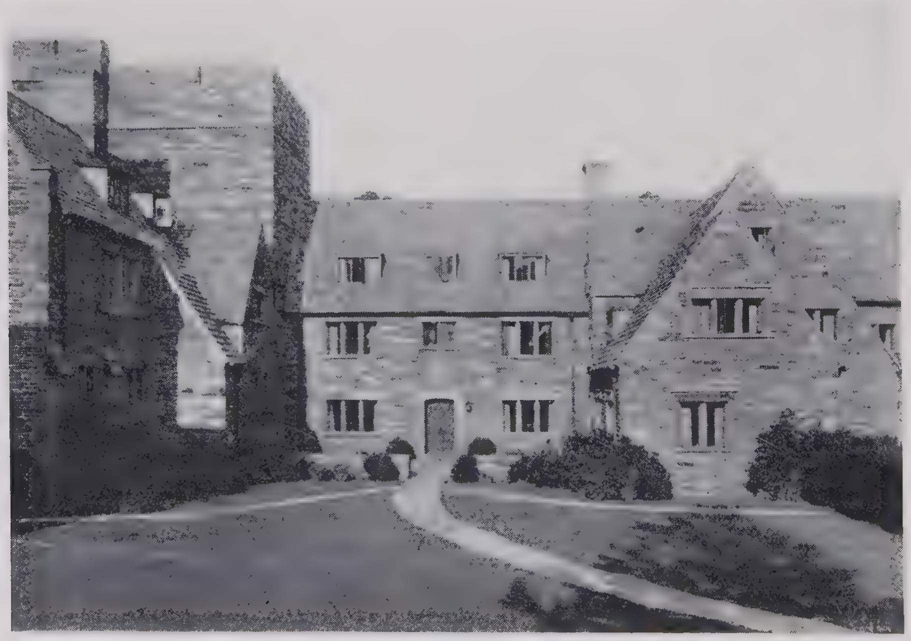
		AREAS	PERCENTAGE
Single Study Bedrooms	2,774.84		
Double Study Bedrooms	3,093.84		
Students' Closets	535.23	6,403.91	72.55
Students' Toilet-rooms		962.83	10.91
Common Room		784.00	8.88
Parlor		218.17	2.47
Matron's Two-room Suite		264.27	2.99
Kitchenette		74.76	0.85
H. M. S., Linen and Hall Closets		119.41	1.35
		8,827.35	100.00

Note: In "Q" the Matron's Suite consists of a parlor and adjoining bedroom only; in "R" of bedroom and adjoining bathroom, the parlor being across the hall and is used also as a general reception-room for the building.

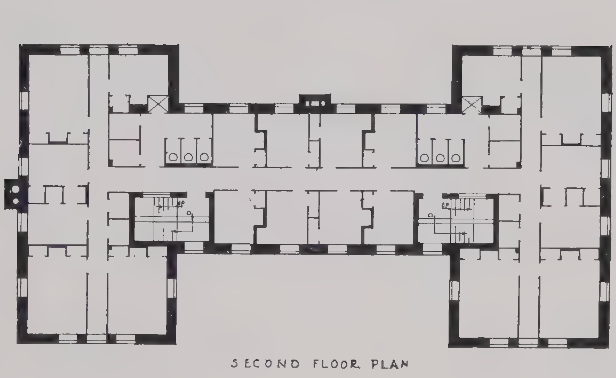
Example "R" is a balancing counterpart of "Q" except for slight differences of room areas, as can be seen in Table V, and it was erected



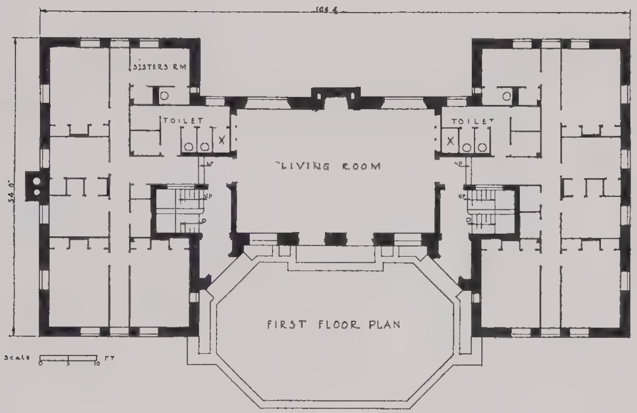
CORNELIA CONNOLLY HALL AT ROSEMONT COLLEGE, ROSEMONT, PA.
GROSVENOR ATTERBURY, ARCHITECT

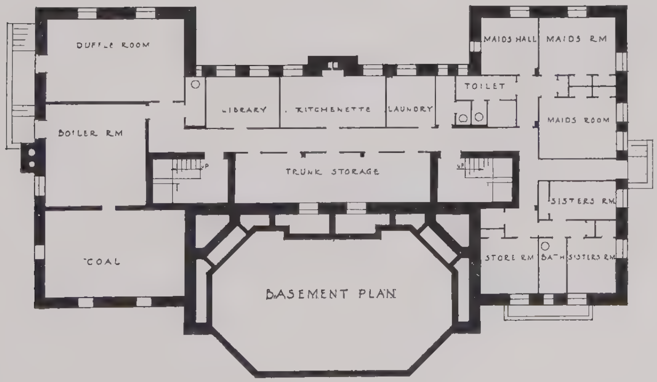


WORTH HALL AT SWARTHMORE.
WALTER T. KARCHER AND LIVINGSTON SMITH, ARCHITECTS

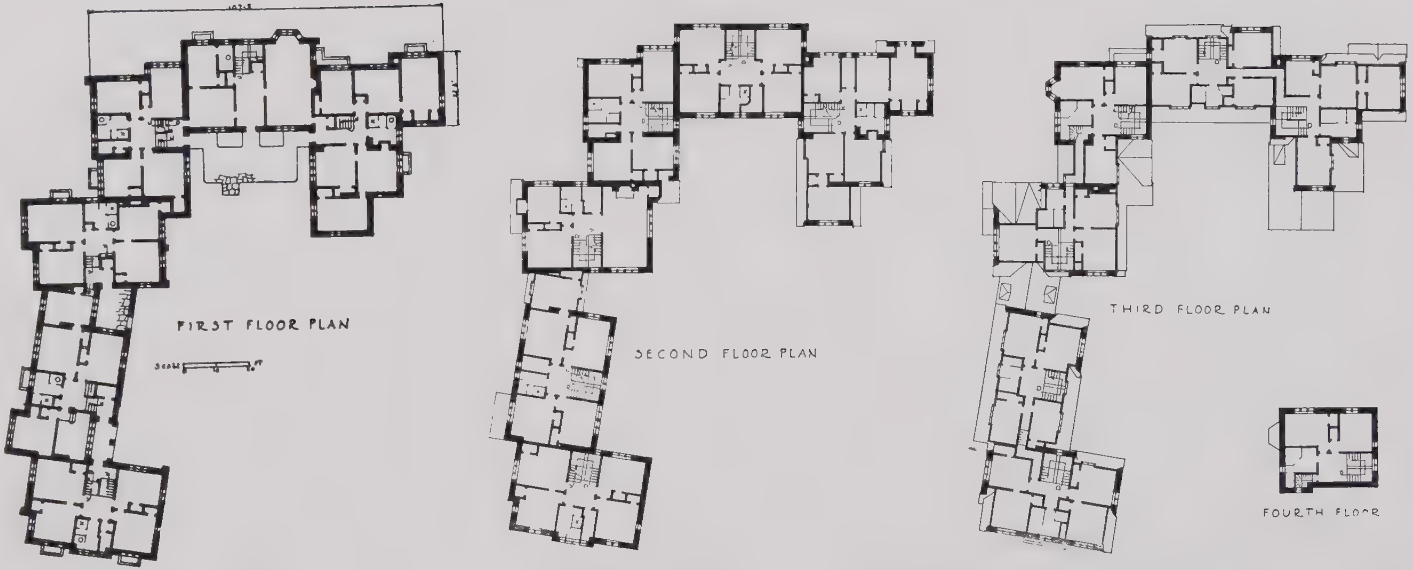


SECOND FLOOR PLAN





PLANS, CORNELIA CONNOLLY HALL AT ROSEMONT COLLEGE



PLANS, WORTH HALL AT SWARTHMORE. WALTER T. KARCHER AND LIVINGSTON SMITH, ARCHITECTS eight years later. Its increased cost reflects the rise of prices during the interval and caused by the War.

Cornelia Connolly Hall at Rosemont College has a large living-room with fireplace as the centre of attraction on the first floor. Two sisters each have a room on this floor, while the two floors above are effectively

PROPORTIONAL AREAS—CONNOLLY HALL

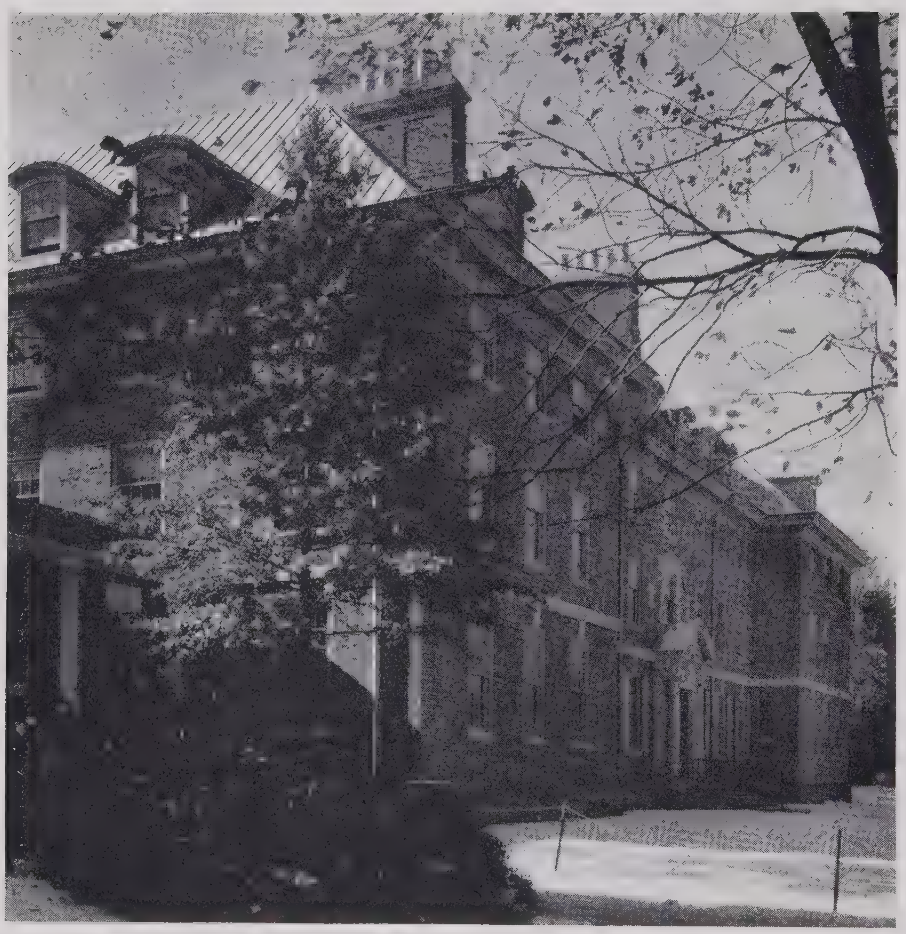
		AREAS	PERCENTAGE
Single Study Bedrooms	2,519.68		
Double Study Bedrooms	2,784.60		
Students' Closets	504.60	5,808.88	59.08
Students' Toilet-rooms		1,212.69	12.33
Living-room		806.18	8.20
Library		125.88	1.28
4 Sisters' Rooms and Toilets		448.25	4.56
Kitchenette		183.64	1.87
Store Room and H. M. S., Linen and Hall Closets		331.19	3.37
Maids' Lodging and Hall		433.33	4.41
Laundry		83.89	0.85
Duffle-room		369.90	3.76
Janitor's Toilet		28.50	0.29
		9,832.33	100.00

PROPORTIONAL AREAS—WORTH HALL

		AREAS	PERCENTAGE
Single Study Bedrooms	10,080.21		
Students' Closets	666.16	10,746.37	80.56
Students' Toilet-rooms		1,270.90	9.53
Lounging-room and Reception-room		700.03	5.25
Matron's Suite		320.78	2.40
Kitchenettes		215.96	1.62
H. M. S., Linen and Hall Closets		85.00	0.64
		13,339.04	100.00

planned to accommodate 70 students, about half of whom are in double rooms and the remainder in single ones. In the basement, which is well out of the ground, are all the desired facilities including even a boiler-room, rendering the building as independent and self-contained as it is possible to be without food service, and it therefore has something in common with the cottage type of dormitory to be seen at some of the older institutions.

Another example of a domestic type is the picturesque rambling series of six houses comprising Worth Hall at Swarthmore. It repre-



WEST RESIDENCE HALL, UNIVERSITY OF ILLINOIS.
CHARLES A. PLATT AND JAMES M. WHITE, ARCHITECTS

sents about one-fourth of the ultimate group contemplated. With the exception of one common or lounging room, the present houses are entirely occupied by student rooms.

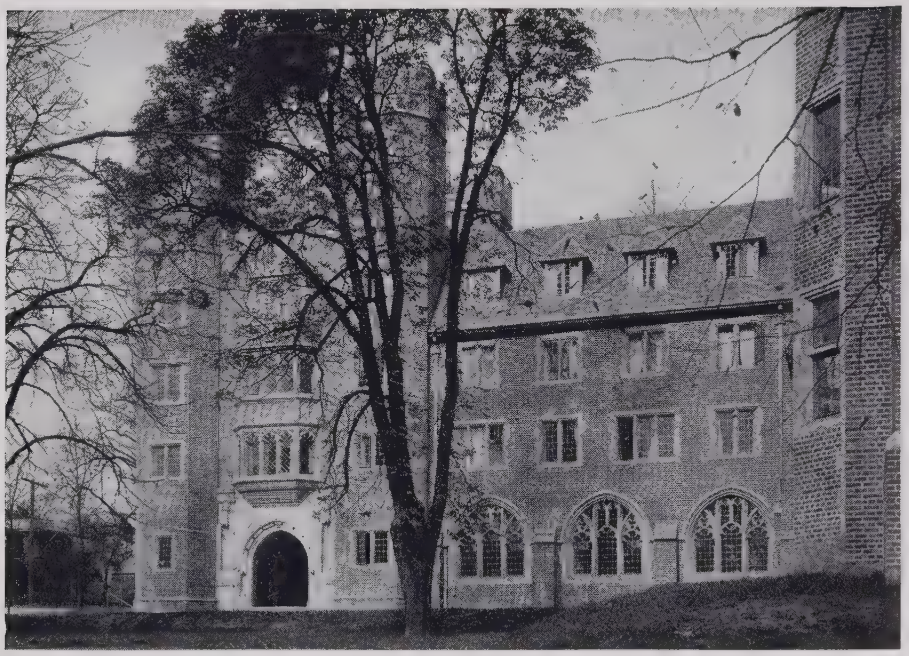
West Residence Hall at the University of Illinois is of the compact plan, providing the maximum lodgment, *i. e.*, for 144 girls. The terminus of one wing on the first floor is a sun-parlor and reading-room. Corresponding spaces on the second and third floors are sleeping porches, each having six double-deck beds, giving sleeping accommodations for 24 girls. Two girls, one of whom sleeps on the porch, are allotted to each bedroom. The floors are of concrete tile joists, with cement top covered with linoleum. The walls are 13 inches brick and 4 inches hollow brick plastered direct on the hollow brick. The partitions are clay tile, plastered both sides. The bedrooms have built-in wardrobes, with shelves, shoe racks and poles for hangers. The wardrobes are provided with doors rather than curtains.

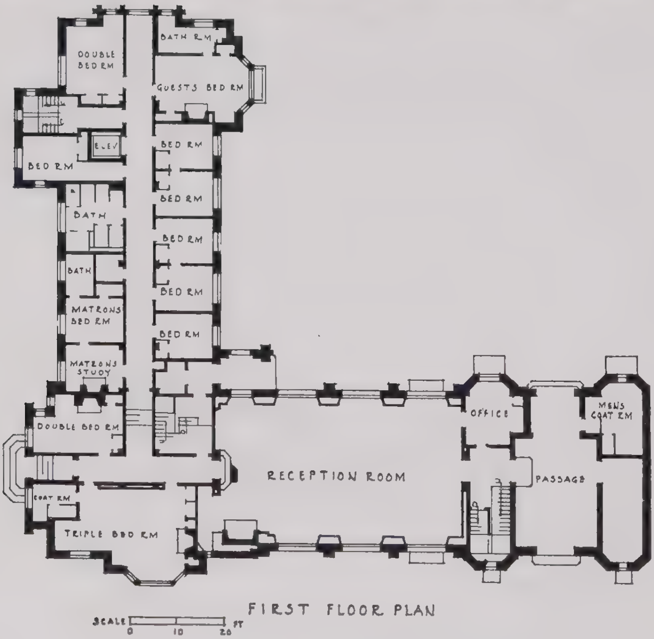
PROPORTIONAL AREAS—WEST RESIDENCE HALL

		AREAS	PERCENTAGE
Single Bedrooms	13,004.58		
Sleeping Porches	1,093.95		
Students' Closets	856.16	14,954.69	76.67
Students' Toilet-Rooms		1,629.06	8.35
Reception Room		737.50	3.78
Living-Room		1,137.13	5.83
Kitchenettes		138.70	.71
Matron's Suite		224.00	1.15
Chaperone's Suite		439.73	2.26
Attendant's Room		64.22	.33
Linen and Storerooms and Closets		180.00	.92
		19,505.03	100.00

When the dormitory and number of women student occupants become larger, the above facilities should be improved and increased. The common room should have an alcove or balcony for musicians. Instead of only one reception-room there should be two or three. A quiet sitting or study room or two on the upper floors are desirable. There should be another suite for a resident member of the faculty, more kitchenettes and a larger laundry. If the dormitory houses considerably more than 65 or 75 students, one kitchenette on each floor is necessary and if the plan be far flung, two on each floor will be needed.

The dormitory just completed at Elmira College is about one-fourth the extent of a range of buildings that will eventually form a quad. The main entrance is through an arched and paved passage in the ground floor of the tower, and one of the three stairways of the present building has a logical place there. Typical bedrooms are 10 x 12 feet, including the closet area, but there are some delightful rooms accommodating three students. In addition to the general lavatories on each floor there are some rooms with a bathroom en suite. These it might hastily be assumed yield a larger rental than the other rooms. But at Elmira this is not the case. At the request of the students themselves the proportionately greater cost of these rooms with private baths has





NEW DORMITORY AT ELMIRA. COOLIDGE, SHEPLEY, BULFINCH & ABBOTT, ARCHITECTS been spread over all the other rooms, and quarters are obtained by lot at the same expense to each student.

Another example of this more elaborate scale of women's dormitories is Harwood Court at Pomona, a building housing 185 girls and well suited to the needs of southern California. It has parlors, offices and faculty suites near the main entrance, sitting-rooms and libraries for the residents in the private reaches of the wings, a large number of bathrooms within the suites and also entered from the halls, and many suites consisting of two rooms with sleeping porch between them. On these sleeping porches as many as four cots are placed. The basement contains a fair-sized meeting-hall with a stage at one end and also finished quarters for ten maids—sleeping-rooms, kitchenette, sitting-room and bathrooms. As the girls do a great deal of their own laundry work there is considerable space taken up by a room for the laundry, a second for drying-room and a third for ironing. The walls are of concrete, with two-way reinforcement as is frequent in California, and of the same material are the floors and stairs. The girls have their meals at the college dining-hall about a block distant.

PROPORTIONAL AREAS—HARWOOD COURT

	AREAS	PERCENTAGE
Bedrooms	13,028.14	59.37
Sleeping Balconies	1,053.50	4.80
Bathrooms and Toilet-Rooms	3,267.03	14.89
Sitting-Rooms	1,266.39	5.77
Parlors, Entrance Hall and Waiting-Room	2,175.60	9.92
Library	248.00	1.13
Sewing Room	109.28	.50
Kitchenettes	88.00	.40
Dean's Suite	415.00	1.89
Offices	292.09	1.33
	21,943.03	100.00

In the dormitories, Campbell and Hendricks Halls, at the University of Oregon a sleeping porch is an integral feature of each suite. This has a student's room on each side of it. Each building was originally planned for two girls per suite, making a total of 60, but force of circumstances has increased the number of occupants. There is a suite for a house mother in each building. These two units comprise about two-fifths of a contemplated U-shaped group of dormitories with a refectory wing midway of one side.

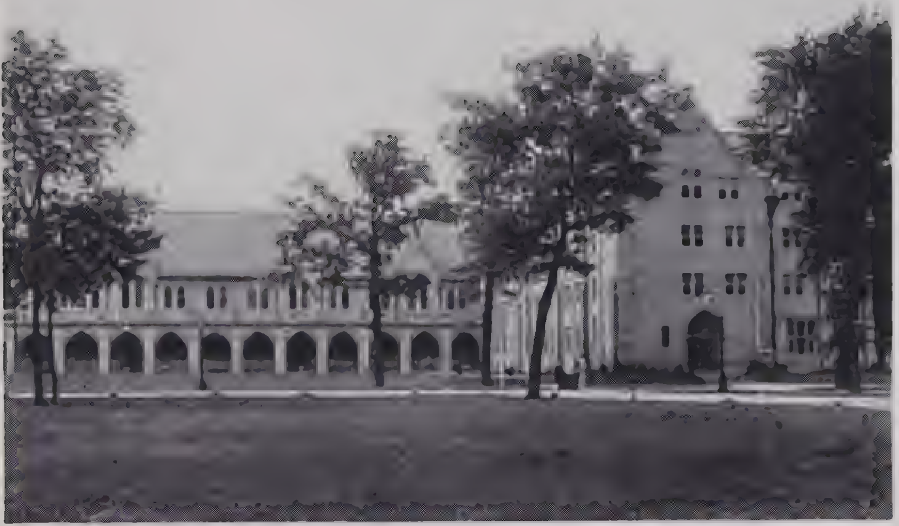
With the exception of the dormitory at Oregon, which is not fireproof, the average cost per cubic foot of the eight women's dormitories above described is 68 cents and the cost per student is $2,015.00.

PROPORTIONAL AREAS—NEW DORMITORY AT ELMIRA

		AREAS	PERCENTAGE
Single Study Bedrooms	7,348.98		
Double Study Bedrooms	3,691.28		
Triple Study Bedroom	406.94		
Students' Closets	1,012.39	12,459.59	68.84
Students' Bathrooms		1,216.03	6.72
Reception-room		1,521.88	8.41
Matron's Suite		283.67	1.57
Faculty Suites		1,512.34	8.36
Guest Suite		253.50	1.40
Kitchens		267.05	1.47
Office		130.00	0.72
Men's Coat-room		149.00	0.82
Storage-room, Service, Janitor, and H. M. S., Closets and Telephone-booths		306.36	1.69
		18,099.42	100.00

In still larger and more comprehensive dormitories more house mothers' suites should be provided so that the number of girls over which a "mother" holds her beneficent sway should be not too great. There should be at least one suite of rooms for visiting members of the students' families. Where this has been tried it has been found highly satisfactory and a means of increasing the income of the building. There should be a study-room or library upon a quiet upper floor, and sleeping porches, if not incompatible with the architectural design, are desirable. A valued feature is a music-room where a piano can be played without disturbing conversation, as it does in a general living-room. A dormitory of this size and scale should also contain bedrooms for maids; in fact, there is an increasing tendency to house some maids in all girls' dormitories. The difficulty of obtaining maids runs apace with the comforts that must be provided them; and the first of these comforts is to lodge the maids in the building where their daily work is done and not to require them to walk from other buildings in bad or wintry weather. The rooms for maids should be grouped in a wing or else in a portion of the basement if it is sufficiently far out of the ground to render the rooms cheerful and free from dampness.

As the providing of food for resident students is of greatest import at women's dormitories, we shall first consider it in connection with these. Girls especially like to carry on all the activities of home life under their own roof, and hence the eating of meals on the first floor of the house in which they live is a practice that they will not willingly abandon. It is, in a word, more homelike. Moreover the inconvenience, loss of time and exposure of making an outdoor journey for



DORMITORIES AT ROSARY COLLEGE, RIVER FOREST, ILL.
CRAM & FERGUSON, ARCHITECTS

CAMPBELL AND HENDRICKS HALLS, UNIVERSITY OF OREGON.
LAWRENCE & HOLFORD, ARCHITECTS

HARWOOD COURT, POMONA COLLEGE. JAMIESON & SPEARL, ARCHITECTS

her meals is more keenly felt by the girl student. Dining-rooms and kitchens are invariably found within or immediately adjoining dormitories for women.

At some colleges the preparation of food is carried on at twenty or more places. The maintenance of so many food service centres is undesirable from the point of view of plant economics, and efforts have been made to cope with it. Inasmuch as the productive capacity of a kitchen and its appendant spaces far exceeds the proportion of area they occupy, there arises the problem of how to make one kitchen serve more than one dormitory and yet not be remote from each. An

PROPORTIONAL AREAS—CAMPBELL AND HENDRICKS HALLS, UNIVERSITY OF OREGON

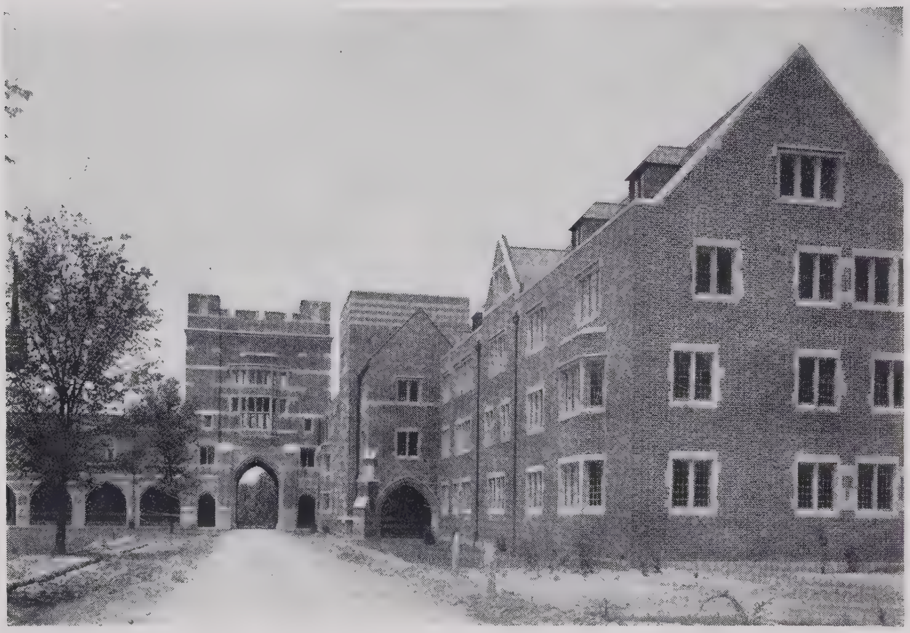
	AREAS	PERCENTAGE
28 Suites, each Housing Four Students:		
Studies	4,428.70	37.67
Sleeping Porches	2,089.70	17.78
Dressing-Rooms	2,808.84	23.89
2-Room and Bath Suites	519.16	4.42
Bathrooms	813.83	6.92
Living-Room	804.00	6.84
House Mother's Suite	291.31	2.48
	11,755.54	100.00

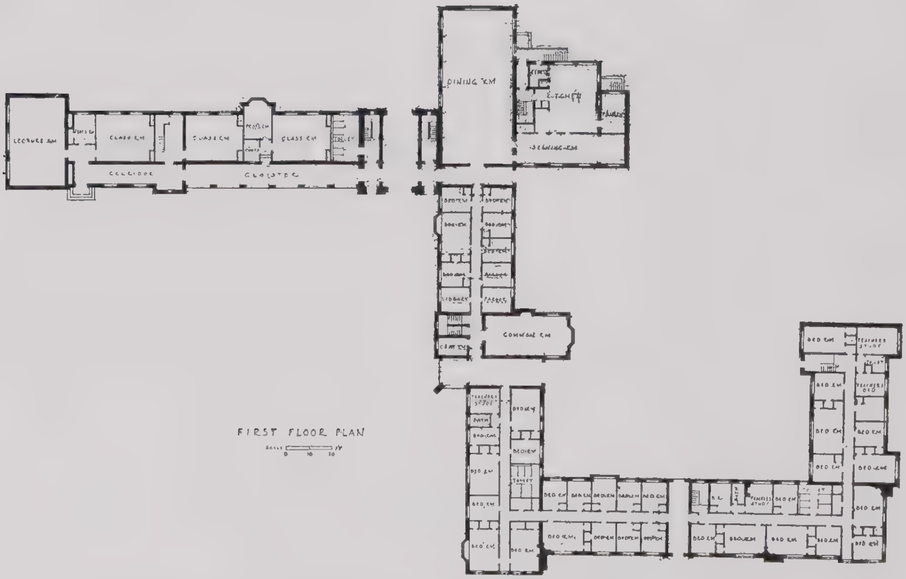
answer is found in the placing of a food service unit between two dormitory units.

Let us take the case of Bryn Mawr, for example. The first dormitory was Merion Hall, built in 1885. At one end of the plan were the dining-room and kitchen. The next dormitory, Radnor Hall (erected 1887), was an entirely separate building standing apart from the first and likewise had the food service at one end. The next was Denbigh Hall, 1891, and this too was separate and apart and had the food service rooms at one end completely occupying a terminal wing. When Pembroke Hall was built in 1894 the food service was located for the first time in the centre of the building, serving both Pembroke East and Pembroke West. Rockefeller Hall, 1904, has the food service in one wing at the end, and it is probable that a future dormitory unit will be placed adjoining it so that it also may serve in two opposite directions.

Everett Hall at Wheaton and Severance Hall at Wellesley were planned to have the food prepared in a kitchen already existing in an adjoining building. Everett, dedicated October, 1926, is in the Georgian style of brick and fireproof construction and, with a cubage of 598,430 feet, accommodates 150 students. Severance, completed December, 1926, is of similar construction but in the Gothic style. It has a cubage of 635,000 feet and accommodates 130 students, 4 faculty and 3 maids. Tower Court Dormitory at Wellesley had its own dining-room with the kitchen at the end of the building. When Severance was built against its older neighbor, doorways were cut in the old wall and Tower Court kitchen now serves both dormitories, having a combined capacity of 330 students and 17 faculty.

Dormitories planned with food service rooms in such a position that the dormitory part of the plan may be duplicated in a future building, or at least when built made to adjoin the dining-room and kitchen are those at Richmond College, West Hampton (Richmond College), Heidelberg University at Tiffin, O., Reed College at Portland, Ore., and the new dormitory at Whitman College. The refectory wing at the University of Oregon will ultimately stand midway in a dormitory group but now serves a building eventually to be replaced by extensive ranges of residential buildings. Another solution in the case of two or three dormitories closely grouped is to place a dining-room in each but a kitchen and food preparation room in one only, and to transport the food hence through underground passages to the serving rooms of the other dormitories. At Illinois, at Chicago and at Northwestern this method has long been followed and we are assured with entire satisfaction.





DORMITORIES AT WESTHAMPTON COLLEGE, UNIVERSITY OF RICHMOND.
CRAM, GOODHUE & FERGUSON, ARCHITECTS

The Club Dormitory opened for the session of 1925–26 at the H. Sophie Newcomb Memorial College for Women, New Orleans, is a good example of the co-operative dormitory. It is intended to assist students of moderate means who are willing to help reduce the cost of their college education by co-operative effort. The building has all the features of a home. A cook is the only paid employee and the students do all the work except cooking. This building is of brick and stone and has a capacity of about twenty-five students, housed in sixteen single bedrooms on the second floor and four double bedrooms on the first.

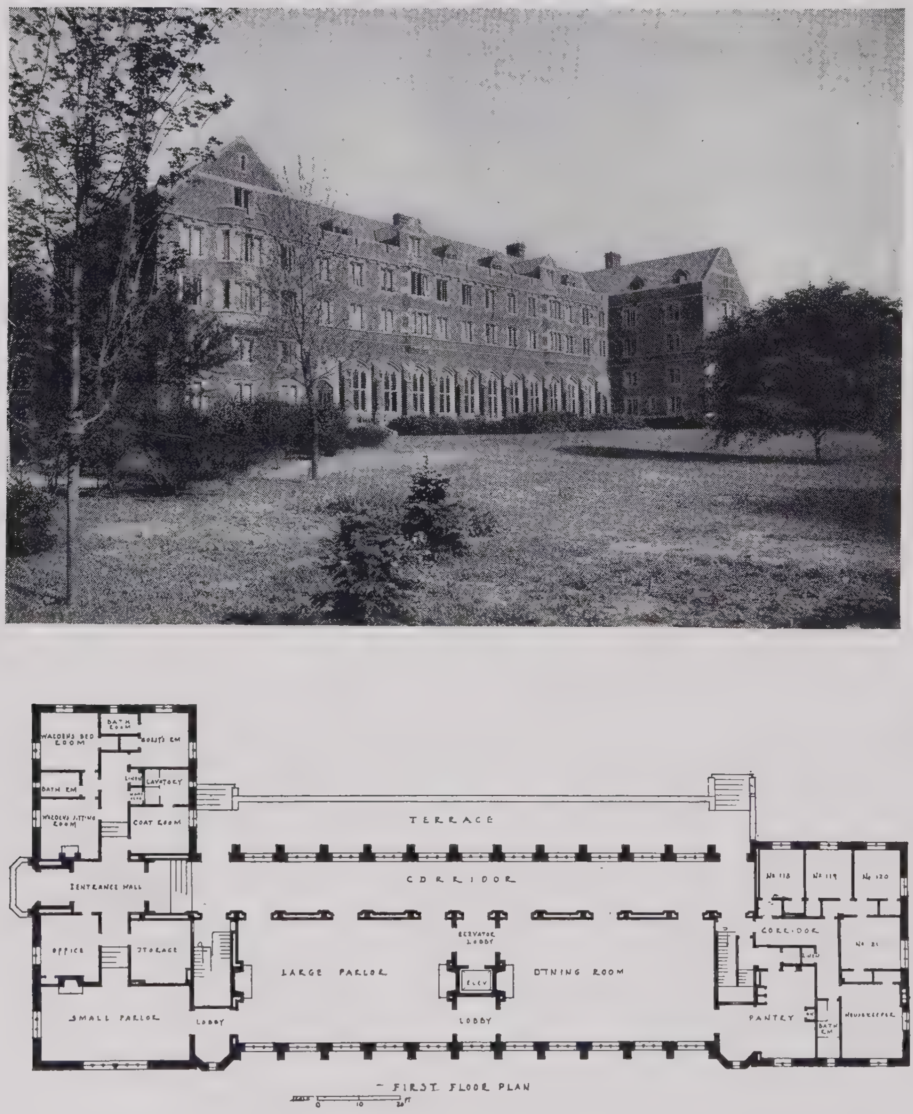
Co-operative dormitories of other types and often utilizing private residences are doubtless maintained at many institutions. For example, at Chicago a group of sixteen students divided themselves into relays of two girls each and assumed in turn all the duties of maintaining their home, which is a residence owned by the University on Drexel Avenue. The University receives $3.00 a week from each of this group of students to cover use of the building, heat, light, janitor service and repairs.

We now reach the large complete type of dormitory having all the features above described and also one or more kitchens and their numerous appurtenant rooms for food storage, preparation and serving.

The students' refectory is an important element of the plan and is almost centrally located amid the many activities of the interesting group of buildings of Rosary College of the Dominican Sisters at River Forest, Ill.

PROPORTIONAL AREAS—MARTHA COOK DORMITORY

		AREAS	PERCENTAGE
Single Study Bedrooms	16,060.98		
Double Study Bedrooms	3,465.59		
Students' Closets	2,016.81	21,543.38	60.62
Students' Toilet-rooms		1,835.69	5.16
Parlors and General Study-room		2,753.00	7.74
Warden's Suite (2 Rooms, Bath and Closet)		459.03	1.29
Guest's Suite (1 Room, Bath and Closet)		211.53	0.60
Kitchenette		427.43	1.20
H. M. S., Linen and Storage Closets		1,322.28	3.72
Office and Lobby		413.31	1.16
Dining-room		1,562.50	4.40
Serving-room and Pantry		786.05	2.21
Kitchen and Auxiliary Food Service		2,615.05	7.35
Girls' Laundry		346.73	0.98
Coat-room		158.62	0.45
Servants' Rooms		1,104.79	3.12
		35,539.39	100.00



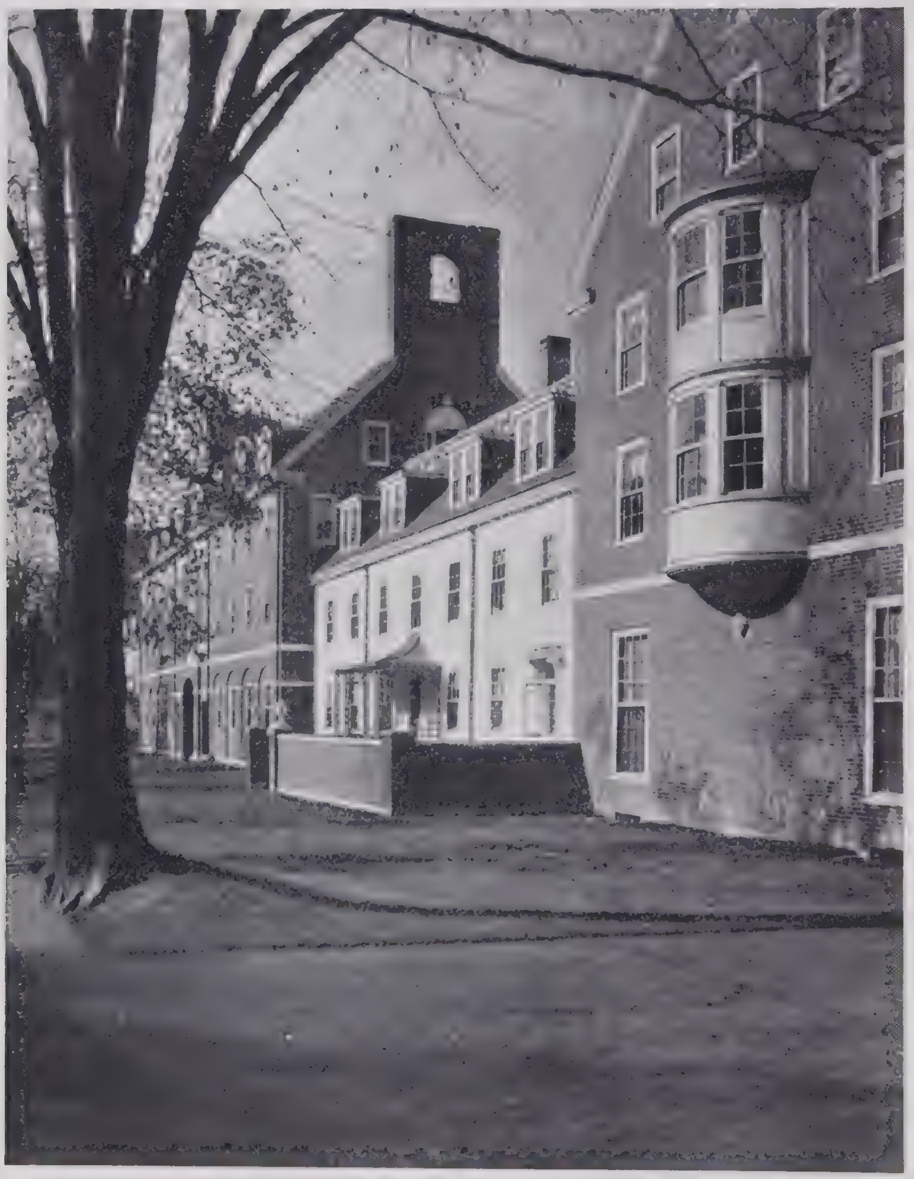
MARTHA COOK DORMITORY, UNIVERSITY OF MICHIGAN. YORK & SAWYER, ARCHITECTS

The Martha Cook Dormitory at Michigan, designed in the Gothic style by York & Sawyer, is an honor house for seniors and a small number of juniors and accommodates a total of 118 students. The walls are of patterned brickwork with limestone trimmings. Nearly all the rooms are single and connect with another to form a suite by means of a lobby or private corridor in which there is a wash-basin for the two or three rooms so grouped. In the few cases where two rooms communicate directly with each other, the first is a study, the second is a double sleeping-room. The only other suites are one for the house warden and one for a guest. Attractive features of the upper floors are the studies, each with bay window and fireplace, at the ends of the main corridors. The dining-room and principal parlor extend in height through a mezzanine story. The kitchen and other rooms for the preparation and storage of food are in the basement.

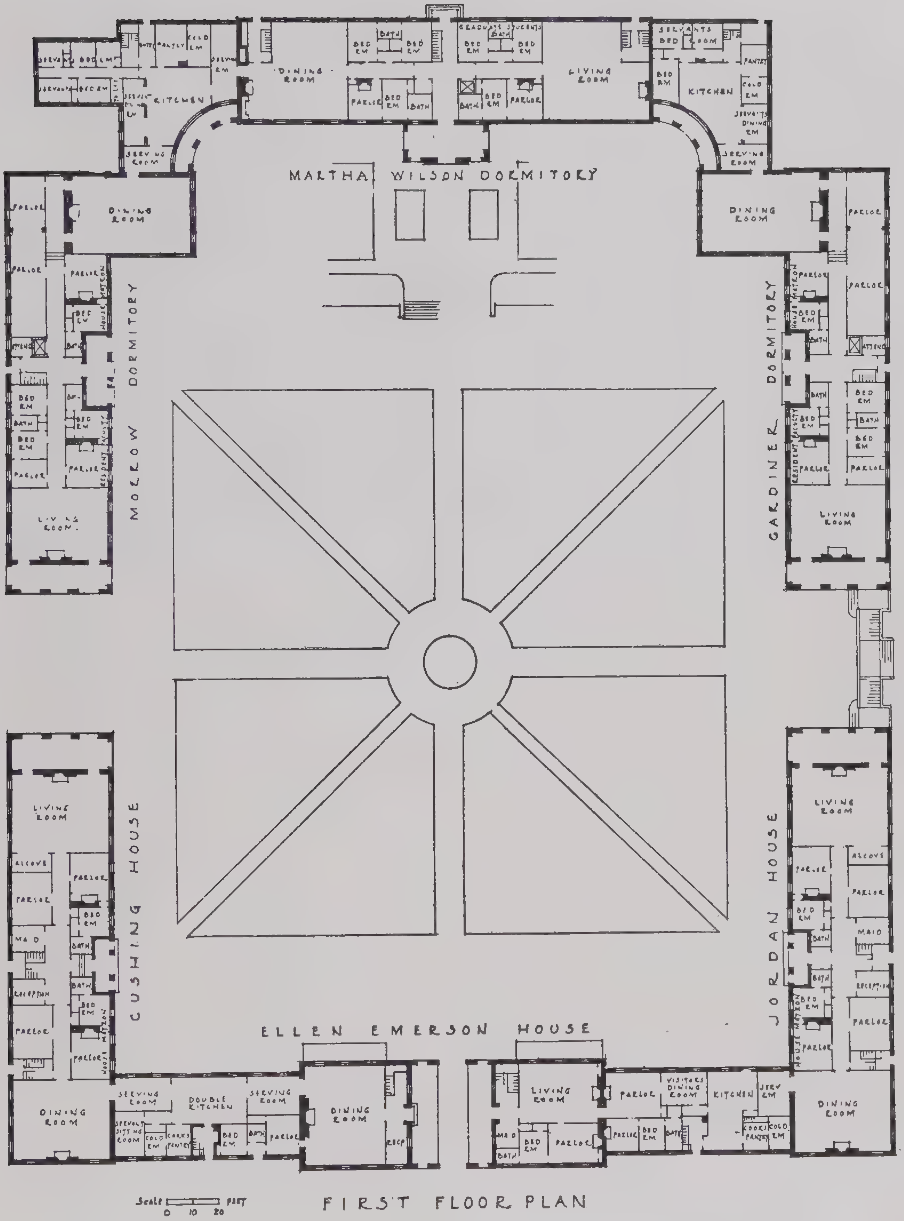
A noteworthy project recently completed is the group of six buildings at Smith College. These are disposed about a courtyard 270 x 320 feet. The northwest end is enclosed by the tower dormitory known as "Martha Wilson House," seated upon a terrace 4 feet high, its main body receding and giving 53 feet more length measured centrally to the courtyard. At the opposite end is the vehicle entrance through an archway in Ellen Emerson House. The style is Georgian. The buildings have in general a waist of 42 feet 4 inches. The walls above the first floor are of hollow terra cotta tile veneered with red brick

PROPORTIONAL AREAS—SMITH COLLEGE GROUP

		AREAS	PERCENTAGE
Single Study Bedrooms	57,839.57		
Two-Room and Bath Suite	417.18		
Students' Closets	4,852.42	63,109.17	53.23
Students' Toilet-Rooms		8,740.14	7.37
Students' Living-Rooms, Reception-Rooms, Parlors and Sitting-Rooms		11,734.17	9.90
Students' Dining-Rooms		7,192.82	6.07
Kitchens, Pantries, Serving-Rooms and Cold Rooms		4,706.50	3.97
Servants' Dining-Room		451.50	.38
Graduate Suite		417.18	.35
Resident Faculty Suites		4,457.57	3.76
House Matron Suites		2,951.02	2.49
Kitchenettes		1,312.81	1.11
Halls, Linen-Rooms and Closets and Storage-Rooms		1,234.77	1.04
Attendants		552.98	.47
Servants' Lodging and Sitting-Rooms		7,229.29	6.10
Visitors' Dining-Room and Pantry		287.67	.24
Loggia and Entrance Loggia		2,275.11	1.92
Sleeping Porch		1,896.31	1.60
		118,549.01	100.00



THE NEW DORMITORIES AT SMITH COLLEGE.
JOHN W. AMES AND EDWIN S. DODGE, ARCHITECTS



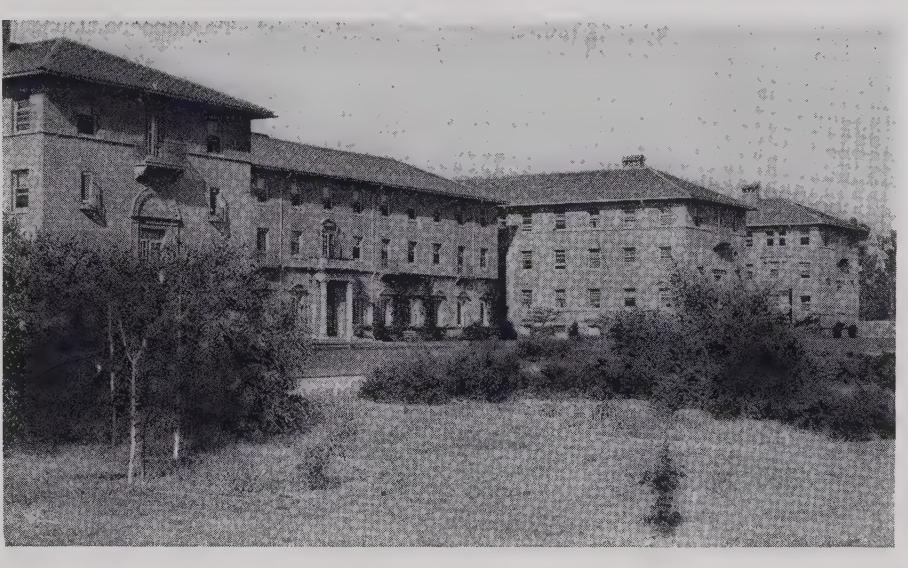
PLANS OF THE NEW DORMITORIES AT SMITH COLLEGE.
JOHN W. AMES AND EDWIN S. DODGE, ARCHITECTS

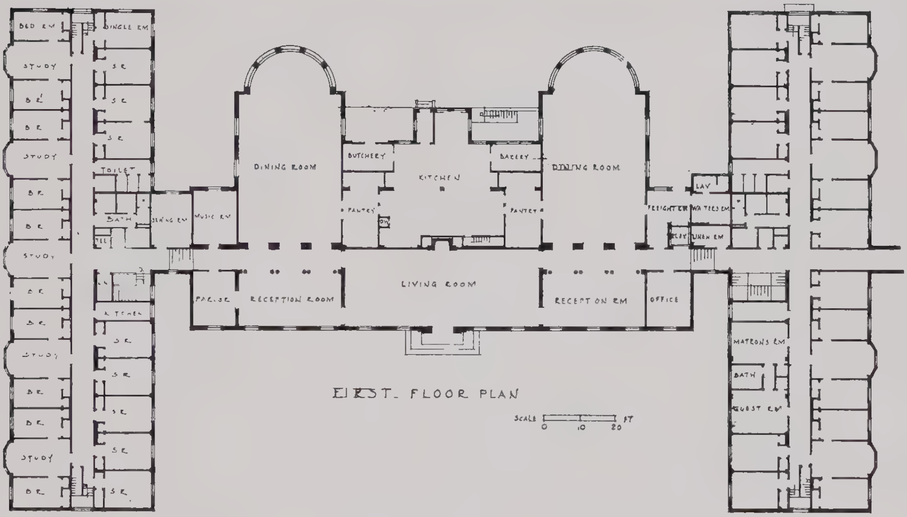
except those of the service portions on which the brick is omitted and the terra cotta coated with white stucco. The four kitchens serve six dining-rooms each having a seating capacity of about 60 persons. The buildings are continuous save for a gap 56 feet long at the centres of the two longer sides of the courtyard. Here dignified stone stairways ascend and descend to the natural grade outside the group. Overlooking these stairways are the sleeping-porches forming termini to the adjoining buildings and each having a capacity of about 20 beds. In general, rooms are 10 x 16 feet in the second and third stories and somewhat larger in the fourth. A total of about 373 students are housed. Other features of the interior are indicated in the table.

All undergraduate women not living at home are required to reside in Roble Hall for their first three-quarters at Stanford University. This building was erected in 1917 and has a plan that has been popularly termed the "butterfly" type, consisting of a main building on each side of which is a wing, the one a counterpart of the other. The living-room, with a reception-room at each end and a music-room share the central body of the building with the dining-rooms, the kitchen and other food service rooms. Each dining-room accommodates 130 at circular tables, each seating 8 persons. Above the kitchen on the second floor is the library or sitting-room and the remainder of this as well as a third story consists of lodging for 154 students. There are single rooms and 3-room suites. In the basement are rooms for 13 servants, most, if not all, of whom are Chinese. The building is of strongly reinforced concrete construction.

PROPORTIONAL AREAS—ROBLE HALL

		AREAS	PERCENTAGE
Single Study Bedrooms	14,284.96		
Three-Room Suites	12,163.60		
Students' Closets	1,484.26	27,932.82	61.59
Students' Toilet and Bathrooms		2,712.29	5.98
Students' Dining-Rooms		2,893.10	6.38
Kitchen and Pantries		1,370.18	3.02
Music, Reception and Living-Rooms, Parlor and Libraries		3,774.06	8.32
Matron's Suite		264.94	0.59
Guest Room		202.59	0.45
Kitchenettes		495.40	1.09
Office		196.88	0.44
Telephone Booths		108.65	0.24
Sewing, Cleaning and Shampoo Rooms		669.11	1.48
Laundry		640.50	1.41
H. M. S., Storerooms, Freight and Linen Rooms		1,247.15	2.75
Waiters' Room and Lavatory		158.00	0.35
Servants' Bedrooms, Closets and Bathrooms		2,681.42	5.91
		45,347.09	100.00





ROBLE HALL AT STANFORD. GEORGE W. KELHAM, ARCHITECT

TOILET FACILITIES IN WOMEN'S DORMITORIES

General toilet-rooms in which all plumbing is concentrated is recommended by the writers, although the argument for wash-basins in each room on the score of convenience is stronger in the case of women's dormitories than for men's. It must be confessed that toilet facilities between single rooms is an arrangement that is growing in favor in some parts of the country. The real value of a wash-basin in a bedroom can be gauged from the reply of an experienced director of dormitories and commons when asked if he would recommend any plumbing in a dormitory building outside the general toilet-room or rooms on each floor. "No," was the reply, "but if we had any rooms with wash-basins in them we could get more rent for those rooms." Where wash-basins in general toilet-rooms have been enclosed in cubicles with doors, as has been done at a few places in the East, they have met with unqualified approval. Bathtubs should be provided in the general toilet-rooms and also showers. The proportion of each should be based upon the choice and experience of the institution, but the

PLUMBING FIXTURES IN WOMEN'S DORMITORIES

EXAMPLE	NO. OF STUDENTS	WASH BASINS	SHOWERS	TUBS	W. C.'S	H. M. S.'S
Example Q	65	11	9	6	9	3
Example R	66	9	7	5	9	3
Campbell and Hendricks Halls, University of Oregon	116	8	8	8	8	8
Connolly Hall, Rosemont College	70	41	6	12	16	0
Everett Hall, Wheaton College	129	27	12	7	17	4
Harwood Court, Pomona College	185	52	25	13	30	1
Martha Cook Building, University of Michigan	124	68	10	12	19	8
New Dormitory, Elmira College	111	22	10	4	18	4
New Dormitory, Westhampton College	182	51	4	19	32	10
New Dormitory Group, Smith College	373	71	29	48	86	13
New Stone Hall, Wellesley College	166	29	23	10	32	8
Roble Hall, Stanford University	154	154	14	22	26	6
Severance Hall, Wellesley College	130	23	18	9	23	7
West Residence Hall, University of Illinois	146	8	8	11	19	4
Worth Hall, Swarthmore	72	35	11	7	18	5
Average Number of Students per Fixture	...	3.4	10.8	10.8	5.8	..

NOTE: The number of occupants are the students housed, and the private toilet-rooms of faculty suites are not included in the table. House-maids' sinks should be proportioned to floor area rather than to the number of occupants of the building.

table on page 160 will be a guide. A dental stand, similar to that in Pullman cars, is convenient and relieves the stress in the toilet-room at the crowded hours. Shower cubicles with the necessary disrobing lobbies in connection with them may be variously arranged, but there should never be more than one entrance to the shower cubicle itself. The shower heads should be located at one side and set to cast the water slantingly. W. C. cubicles (in general toilet-rooms) should be not less than 2 feet 10 inches wide and 4 feet deep, if the door opens outward. If the door opens inward the depth should be increased 1 foot. In some localities W. C.'s are placed in rooms separate from the general toilet-room. Tub cubicles should have one side equal to the length of the tub, the other long enough to give a space 3 feet wide in front of the tub.

CHAPTER IX

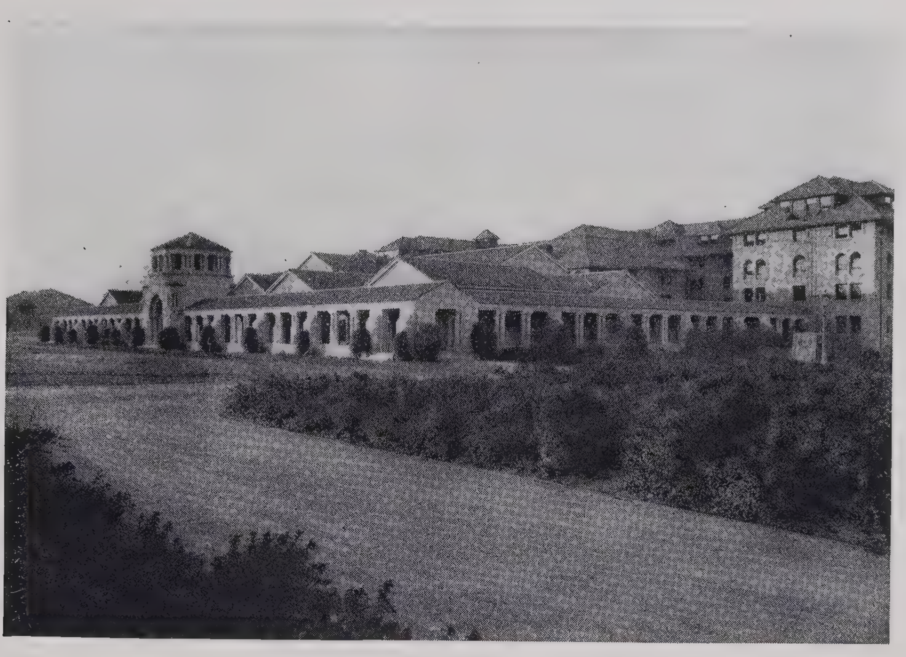
DINING-HALLS AND CAFETERIAS

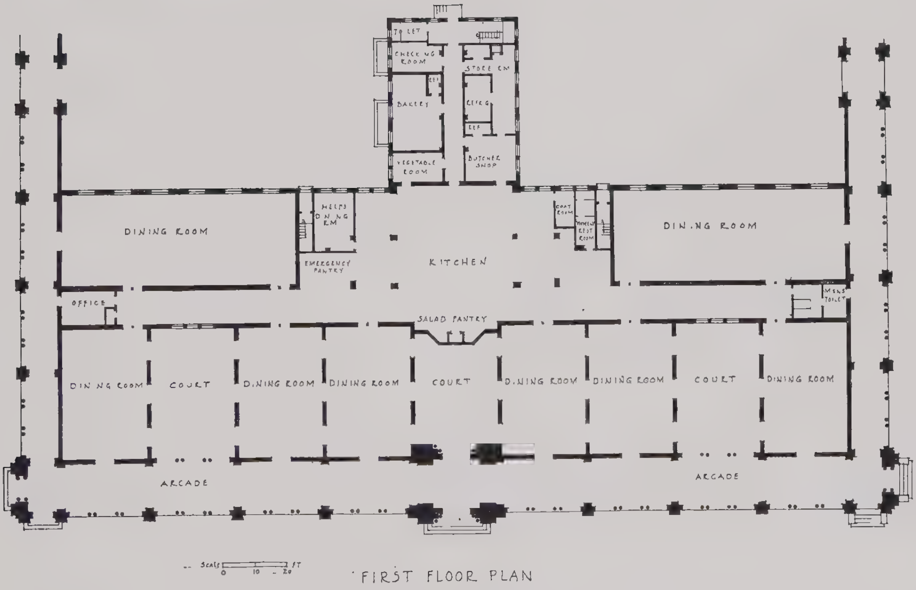
Whether a college shall have a commons, and if so whether it shall give dining-room or cafeteria service or both are administrative problems. Students and faculty must obtain their food somehow and the "somehow," if undertaken by the college, must be carried on without financial loss. Dining-rooms in dormitories, in fraternity houses, student unions and co-operatives, and the homes of the faculty, those of public boarding houses, restaurants and lunch counters,—some or all of these play their part to reduce the patronage remaining to support a college commons.

Objects that a college would have in mind in establishing a commons would be convenience, control of the students' diet, cultivation of good fellowship among students and to insure the students' obtaining a necessity at a reasonable price. We might add an agreeable necessity, for the effect is unfavorably far-reaching of a college so situated that it alone can provide the meals and then to have them unpalatable. Yet there is sympathy for the dietitian of a small state college struggling to serve meals that will be greeted with enthusiasm for the allotted sum of "thirty cents per."

An instance comes to mind of a university in an eastern city of half a million population. Upon all sides are apartment houses, each with its restaurant. Most of the tenants are absent down town during the day, so that these restaurants make a bid for university patronage by offering the midday meal at a price lower than the university could serve it, with no other means than this one meal of sustaining its dining-hall overhead. This institution is conspicuous from the fact that nearly all its students live in or very near the city in which it is located. Their homes provide the remaining two meals of the day. The decision of the university to make no attempt at food service was to be foreseen.

A large university in another eastern city has been obliged to give up operating its memorial dining-hall because it could not compete with commercial establishments. We are told that the University of Toronto, with its beautiful dining-room in Hart House, finds it difficult to compete with the hotels of Toronto for University banquets, even though the charges for equivalent service are 25 to 33 per cent less than those of the hotels.





ENCINA HALL, STANFORD UNIVERSITY. BAKEWELL & BROWN, ARCHITECTS

New York University serves its large student body with a cafeteria of less than 400 seating capacity where the students of the evening school make it possible to distribute the overhead over two meals per day. The University of Pennsylvania makes no attempt at providing food service, so numerous do the commercial restaurants of the city cluster about it, yet the University of Chicago appears to have assured patronage for Hutchinson Hall with its great dining-room 115 x 40 feet, now equipped to serve at least the midday meal on the cafeteria plan.

Turning attention to institutions situated elsewhere than in large cities, we notice that a college in a small town in Ohio requires all students to pay a fee of $35.00 a semester for the support of the commons, and all students receiving scholarship concessions of any kind are required to board there. This and similar regulations insure a basic income. In small communities patronage is increased by permitting the public to eat at the college board. Princeton's five great Gothic dining-halls seating 1170 are built around a central kitchen with which they are connected by short corridors. The Halls are in charge of a salaried manager who reports directly to the Controller of the University. Two are assigned to freshmen and two to sophomores, these classmen being required to eat there. The fifth hall is assigned to upper classmen who do not eat at the clubs. The fact that these men prefer to eat at the dining-halls rather than patronize boarding houses and restaurants of the town is believed to indicate that the board provided by the Halls is better than can be obtained elsewhere. The dining-hall at Dartmouth is a freshman commons where all freshmen are required to eat. College Hall, in which it is situated, contains also a grille-cafeteria and a cafeteria. The University of Michigan operates no commons, but there are a dining-room and a cafeteria in the Michigan Union and the women's dormitories have their own dining-rooms. The University of Washington operates a cafeteria commons on the campus. The commons for men and those for women maintained by the University of Delaware have almost no competition from the eating places to be found in the small town of Newark. At Grinnell the present temporary dining-hall is to be replaced by one that is an important unit of the dining-hall group already designed and partly built. Bowdoin maintains no commons, but accommodations for forty students, preference being given freshmen, are provided at a dining-club in one of the college buildings. A fine dining-hall, seating 200, is a feature of the new group of dormitories for Southwestern University at Memphis. The dining-rooms are the chief source of income of the now profitable Union Dining Hall at Stanford, patronized by men and women students, by the faculty and the general public. It consists of a general restaurant and a cafeteria service. There are also dining-rooms in connection with the men's and women's dormitories.

It is manifest that there is no general rule to be taken as a guide. An institution at such an isolated place as Pennsylvania State College has no commons for men, but relies upon the eating places in the borough. Yet cafeterias are found at Lehigh and the University of California at Berkeley, where the facilities of the neighboring towns are much greater than at Pennsylvania State.

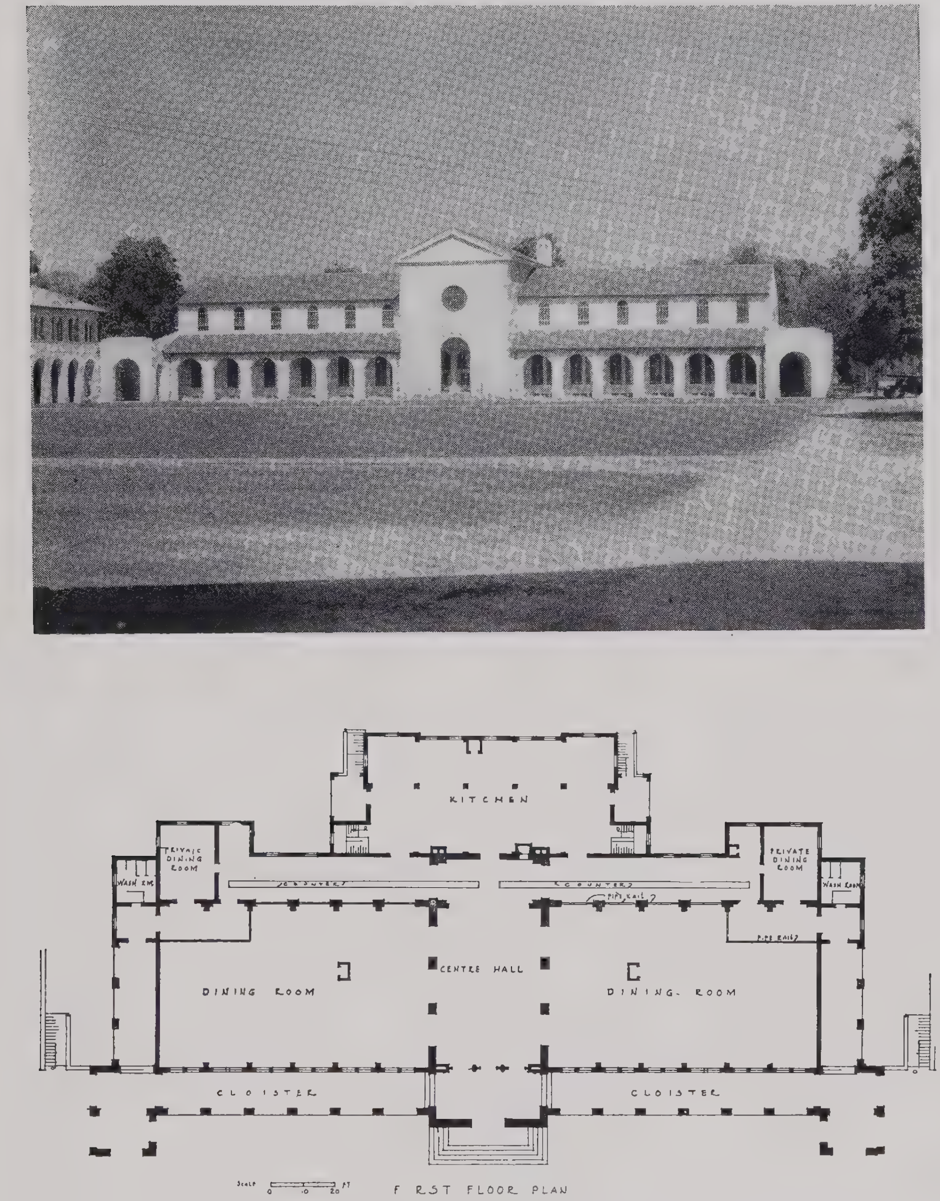
If we single out from these various eating places those on the central campus, it is amusing to find in what a variety of quarters food service is given with a varying degree of official connection with the institution. At Illinois a cafeteria is on the second floor of the Women's Building, at Iowa State College in the basement of the Y. M. C. A., at Wisconsin in the basement of a women's dormitory, at Minnesota in the basement of the Men's Union Building. Obviously custom favors basements for cafeterias. Why does it do so? To be sure there is something strangely furtive about the students' midday eating. Second only to getting the necessary food is the speed with which it can be captured to cause no delay to a full afternoon programme of study or recreation. But is there really a reason why even so hurried a rite should be held so frequently in regions underground? Is it only in the basement cafeteria that the unconscious soul of the student truly expands, where with the inner man, braced with milk through a straw or sweet potions dispensed under cryptic names by the ever-popular fountain, his spirit aspires toward articulation in carved table-tops, facetious manifestoes and the hallowed spoils of student adventure? Rather, it is to be supposed cafeteria eating is so comparatively new that space wherever found has had to be turned to this account. It involves a constant struggle of the management for cleanliness and neatness. Economy of maintenance, low prices of food and the size and variety of the meal it offers have enabled cafeterias to outdistance dining-rooms, but there is a feeling in some quarters that a reaction will sometime appear when the eating of any meal will resume its true place in the art of daily living.

Dining-rooms with adjoining serving-rooms have been turned with astonishing ease to cafeteria needs, and to those of both cafeteria and table service in the same dining-room. The serving-room has been opened to the dining-room by the removal of a length of partition and the tray rail is traversed directly by patrons at one meal and by waiters at another.

We will now consider a few typical modern buildings wholly devoted to college commons. The first to be considered will be dining-halls. In their elements they consist of the primary trio of rooms: dining-room, serving-room and kitchen, with the two additions of space where food is prepared outside the kitchen and space for the storage of food. These five divisions subdivide themselves, as follows:

> *Dining-Room.*—Instead of one room several rooms may be provided capable of all being thrown into one. A lobby and lounge, coat-rooms and lavatories.
>
> *Serving-Room.*—This is sometimes omitted for lack of space, but an insulating region should be provided between the kitchen noise and odor on one hand and the dining-room on the other. Although the latter is not always tranquil, it only adds to confusion if the kinds of noise mingle. If the food is carried but across a hall, the necessary buffer space to noise and odor is obtained.
>
> *The Kitchen.*—Good light and ventilation should be secured by windows on three sides and by a high ceiling. The floor should be of large semi-vitreous quarry tile laid level but with a drain at one or two central points. The walls should be of smooth plaster or of terra cotta blocks with matte finish. The latter is an integral wall material and hence ideal but expensive. Applied material such as encaustic tiles will not stand the wear and tear. The sheet metal of which many of the fixtures are made can be of heavily galvanized iron with all fittings tinned to prevent rusting, or they can be of the more expensive Monel metal.
>
> *Food Preparation and Storage.*—Sometimes upon the same level as the kitchen and dining-room but usually upon the floor below will be a room for the dressing of vegetables, the butcher shop with its refrigerator divided for meats and dairy products and here also, on account of the low temperature of the room, will be the fish chest. Near by there may be a bakery with its coal or electric ovens for bread or pastry or both, and there may also be an ice-cream machine.
>
> Food of all kinds upon arriving should pass a checking and accounting room or desk and then find its way to the proper storage places. Dry groceries should be kept on shelves in a room enclosed with wire screen, surrounded by free space and air and controlled by lock and key. There will be no difficulty in finding a left-over space in the basement for a potato-cellar.

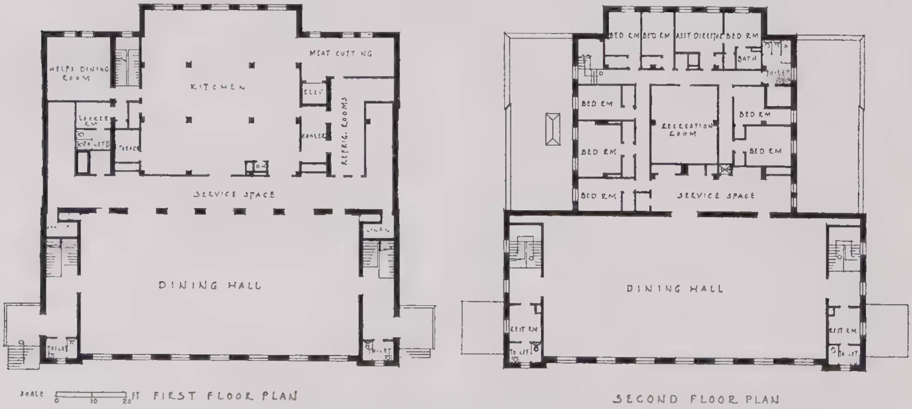
The relative positions of all the kitchen fixtures, that of the range and the dish-washing machine, etc., can be obtained with the advice



CAFETERIA, LOUISIANA STATE UNIVERSITY. WOGAN & BERNARD, ARCHITECTS of reputable firms specializing in kitchen equipment. In some of their catalogues typical arrangements are illustrated. The work of these specialists will depend on these conditions and they must be determined in advance. How many persons are to be served daily? Whether the meals will have fixed menus for all persons, and all served at fixed hours. Whether supplies, such as meats, will be obtained daily from local sources or whether storage must be provided upon a wholesale scale. Whether any bread-baking is to be carried on. (At many institutions it is found better to purchase daily supplies of bread and rolls and ice cream than to make them.) How will garbage be disposed of? What fuel will be used: coal, gas or electricity? What proportions of the food service staff will consist of men and women?

The centre of the scene is the range, and the route of the waiters to secure food from the chef's table in front of it should pass first on coming from the dining-room the dish-washing pantry (where soiled dishes are deposited and clean ones obtained) and last before re-entering the dining-room the dessert and urns counter. Not far from the range will be the vegetable-table and vegetable-sink, and within easy reach of the chef will be his refrigerator. Adjoining the kitchen should be a dining-room for the kitchen staff and an office for the superintendent of commons or the dietitian.

Beginning with the number to be served in the dining-room the architect may sketch out his plan by allowing 12 square feet per person, which is the average given in the table on page 170. He may then allot for the kitchen and serving-room on the same level a space equal to about one-third the dining-room area. With this area



FIRST FLOOR PLAN

SECOND FLOOR PLAN

PLANS OF THE REFECTORY BUILDING AT THE UNIVERSITY OF WISCONSIN. (SEE EXTERIOR VIEW, P. 134.) ARTHUR S. PEABODY, ARCHITECT

RUSSELL SAGE, 2ND, DINING-HALL, RENSSELAER POLYTECHNIC INSTITUTE.
LAWLOR & HAASE, ARCHITECTS

provided on the first floor, it is safe to assume there will be enough space in the story below to accommodate all the remaining activities connected with the preparation and serving of food.

Square tables 3 x 3 feet and circular tables 3 to 3½ feet in diameter and also rectangular tables 2 feet 4 inches by 4 feet are found to seat comfortably four persons. Square tables 4 x 4 feet are found to seat eight persons. Rectangular tables 2 feet 6 inches by 6 feet will seat six persons (three on each side) and circular tables 4 feet 6 inches in diameter will seat six persons. Circular tables 5 feet in diameter will seat eight. Tables 2 feet 10 inches wide and 9 feet 9 inches long will seat ten persons (five on each side) and if two feet longer, will seat twelve persons. A table 2 feet 10 inches wide and 18 feet long will seat comfortably twenty persons with one person at each end.

A good example of a building devoted to food service for men and containing only a kitchen and its appurtenant rooms and dining-rooms is Russell Sage, 2nd, Dining Hall at Rensselaer Polytechnic. It was erected and equipped with a gift of $100,000. The main part is 125 feet long and 44 feet wide, attached to which is a kitchen 75 x 28 feet. The architecture is of the Colonial type, carried out in Harvard brick with Indiana limestone trimmings. Floors and partitions are of fireproof materials. The main dining-room is 98 x 36 x 25 feet high. The kitchen is fully equipped and there are quarters in the building for the superintendent of dormitories and dining-hall.

Tripp and Adams Halls, dormitories for men at Wisconsin, are each built around a quadrangle and will have in the near future two neighboring ones like them in plan and size. The occupants of all four of these dormitories will eat at the Refectory, which has also just been completed and is about one hundred yards distant. This building as it now stands is to be increased in size by an additional dining-room upon each side of it when the four groups of dormitories shall have been completed.

We have already mentioned the advantages and disadvantages of dining-rooms within women's dormitories. A happy solution which permits the dormitories to be kept small in size and separate rather than combined, consists of grouping the houses about a central structure containing the dining-halls, kitchen and food-service offices. In mild climates the short outdoor distance separating the place of eating from that of lodging is found unobjectionable; and it is possible, furthermore, to connect the buildings with arcades having attractive garden courts between them. Examples of this arrangement are at

DINING–ROOM AREAS AND SEATING

THE SEATING IS UNDER NORMAL CONDITIONS, AND FOR BANQUETS AND OTHER SIMILAR OCCASIONS MAY BE CONSIDERABLY INCREASED

	AREA IN SQ. FT.	NUMBER OF SEATS	SQ. FT. PER PERSON
Men's:			
University of Chicago, Hutchinson Dining Hall	4,605.89	300	15.35
Dartmouth College Dining Hall	4,000.00	400	10.00
University of Delaware, Old College Hall	2,638.00	200	13.19
Johns Hopkins, Alumni Memorial Hall	1,688.00	140	12.06
Pennsylvania State College, Varsity Hall	1,206.84	106	11.39
Princeton University Dining Halls (5)	14,565.49	1,170	12.45
Stanford University, Encina Hall	7,820.00	500	15.64
Yale University Dining Hall	13,260.00	1,400	9.47
Women's:			
University of Chicago, Ida Noyes Hall	4,013.25	300	13.38
University of Delaware, Women's College Dining Hall	4,217.64	240	17.57
Elmira College Dining Hall	3,610.00	250	14.44
Wellesley College:			
The New Stone Hall	2,416.00	176	13.73
Severance Hall	1,479.63	120	12.33
Wheaton College, Everett Hall	2,661.17	250	10.64
Average Square Feet per Person	....	....	12.97

the Women's College of the University of Delaware and at the Western College for Women. Each dormitory retains its unity and individuality and is rid of the odor of cooking which the best of housekeeping cannot prevent. At Delaware the dining-hall building as erected consists of three halls separated by accordion doors so that the three rooms can be thrown into one, but on occasions only, for it has been found generally here and elsewhere that if more than about 70 girls eat in one room the noise emanating from other sources than the moving of dishes and chairs, if not unbearable, is certainly not an aid to digestion. At an eastern university in a large dining-hall where several hundred girls eat, though the ceiling height is conducive to the dissipation of sound, acoustical felt has been applied to this ceiling, but it is of no avail to still the resounding waves of strident volubility.

The Encina Hall Dining-Rooms at Stanford University are in a building one story in height, save for a second story containing bedrooms for help over part of the rear portions. It consists of a number of small dining-rooms, each of which is used and run by an eating-club. These eating-clubs were first established by the students themselves when housed in temporary quarters until this building was erected to care for them. There is one large dining-room on each side of the kitchen which was intended to be used by such men as did not belong to any particular eating-club. Two courts are enclosed in the plan.

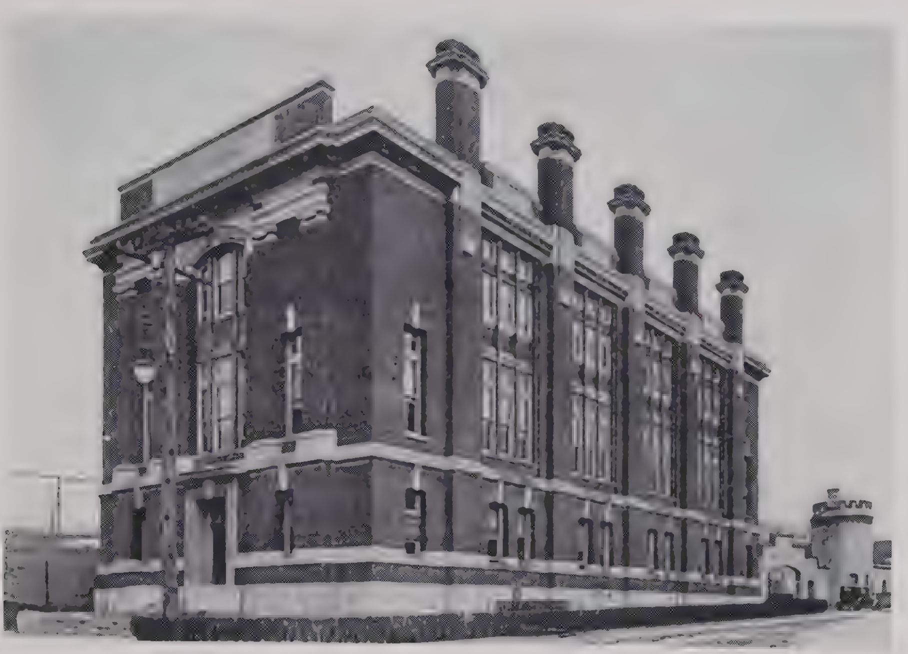
The Refectory at Trinity College, Washington, D. C., is 241 feet long over all and contains two dining-halls, each 46 x 85 feet and each seating 250. After the first design was made, it was decided to add two stories of bedrooms to the building, but the lower floors show very complete food service facilities, a cafeteria being located in the basement on the same level with the kitchen.

CHAPTER X

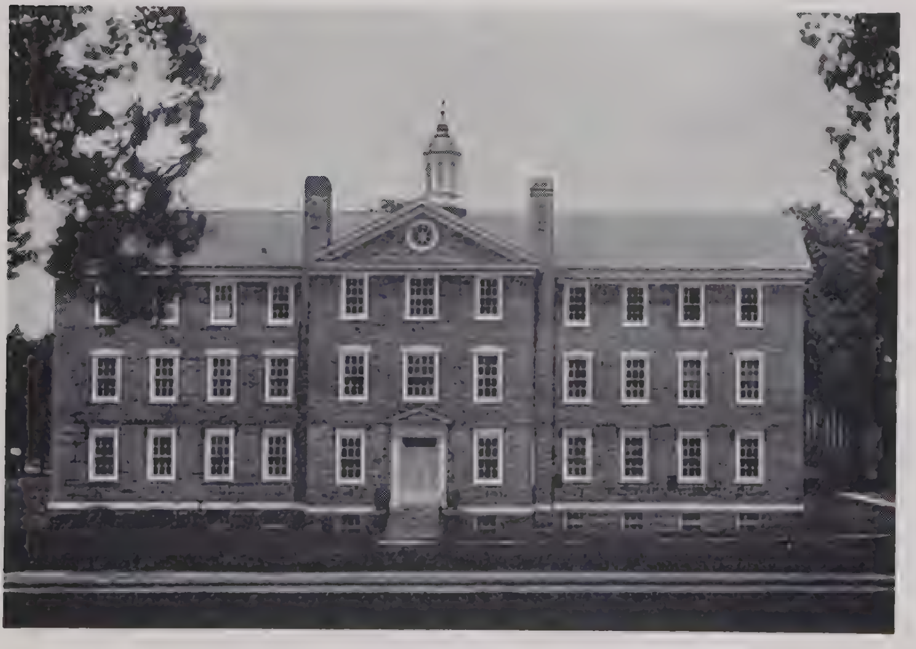
BUILDINGS FOR THE NATURAL SCIENCES

In the science building of a small college will be taught geology, biology (botany and zoology), physics and chemistry, perhaps also mathematics and astronomy. It will not differ radically in outward appearance from the academic type of buildings described in Chapter Four. It will have an office near the entrance for the head of the department and two or three other rooms for assistant professors and secretaries. There will be several classrooms, each of a size to accommodate about 30 students at the most, one or two lecture-rooms, a reading-room, a drafting-room, an herbarium and most important of all, class laboratories, each with its accompanying apparatus and stock-room. There will be a balance-room, an X-ray room, a dark room and a private laboratory (office) or two for professors. There will be a room serving as a museum, unless provision for exhibits is made in hallways or lobbies. In the basement there will be a storage-battery room, locker-room, store and stock rooms, a packing-room, a repair-shop and perhaps a laboratory or shop that must have heavy mechanism.

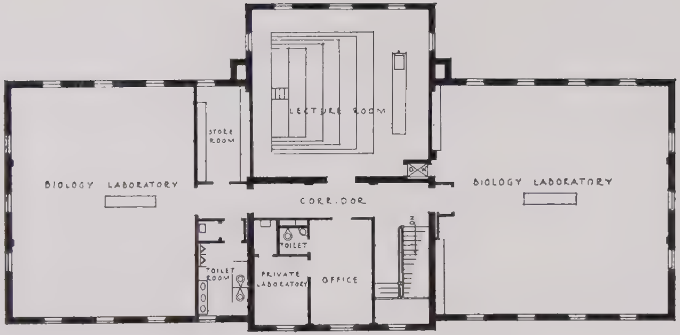
Various causes may lead to a separation of the science teaching, and there come to mind the Biology-Geology Building at Hamilton College, the Eastman Hall of Physics and Biology at the University of Rochester and at Haverford the Sharpless Science Hall in which physics, biology and physiology are taught, chemistry fully occupying Beecher Hall near by. Further particularizing of the teaching carries with it a more highly developed building for each science, and finally there is to be found a single branch of science in full possession of a building planned with minute regard to all the ramifications of that particular study. At universities and large colleges will be found separate buildings devoted entirely to one or more of the four primary branches of science we have named. These buildings and their equipment will differ according to their purpose of providing facilities either for the teaching of undergraduates or for graduate research. Since graduate and research work requires more space per student than does undergraduate work, it is not surprising to find at a university like Johns Hopkins, for example, that geology, physics, biology and chemistry will each have eventually a large building enclosing the rectangular campus of the beautiful group at Homewood.



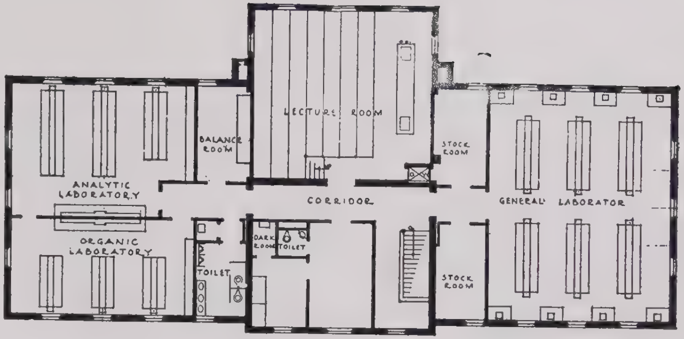
MORTON HALL OF CHEMISTRY AT STEVENS INSTITUTE, HOBOKEN, N. J.
ACKERMAN & ROSS, ARCHITECTS



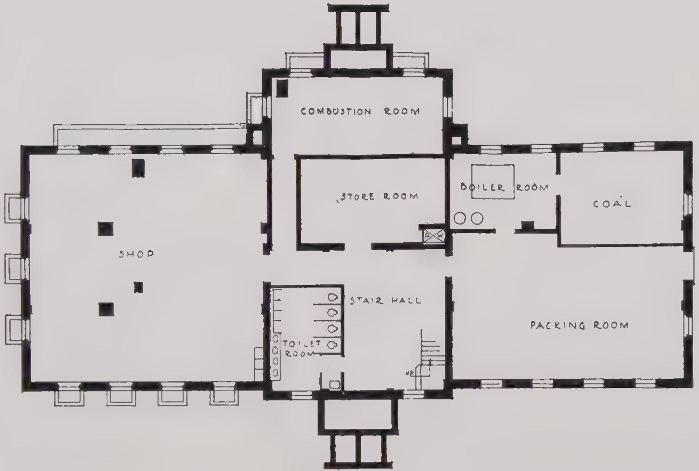
SCIENCE HALL, HAMPDEN SIDNEY COLLEGE, VIRGINIA.
THOMAS VISSCHER AND JAMES BURLEY, ARCHITECTS



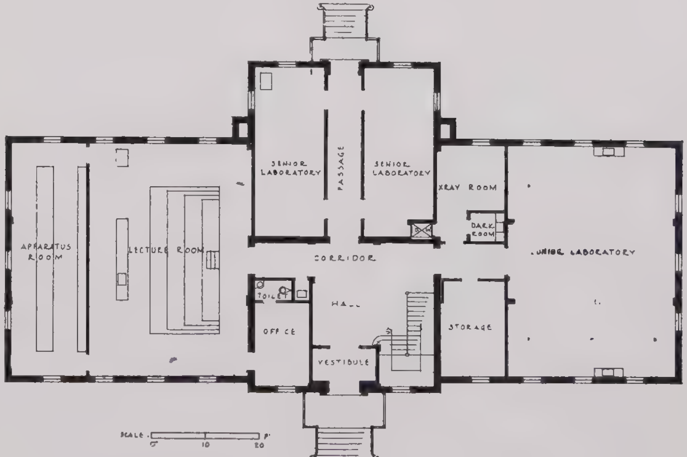
SECOND FLOOR PLAN



THIRD FLOOR PLAN



BASEMENT PLAN



FIRST FLOOR PLAN

PLANS OF SCIENCE HALL, HAMPDEN SIDNEY COLLEGE, VIRGINIA. THOMAS VISSCHER AND JAMES BURLEY, ARCHITECTS

Primary structural essentials of science buildings are stability to prevent vibration, ample lighting, both natural and artificial, and the use of materials insuring as far as possible the elimination of dust. The plan should provide for the largest classes in the first story, *i. e.*, below the smaller and advanced classes. If two lecture-rooms must be provided, and if they are large enough to require sloping floors, space can be economized if one of these is placed over the other, for the under surface of the sloping floor of the upper one can become the ceiling of the lower one. The larger lecture-room, if not both, must have a projection booth.

There should be balance rooms on upper floors, and in addition one for finer measurements in the basement, upon its own foundation independent of that of the building. If the building is four stories high, including the basement, an elevator will be needed.

Inasmuch as the teaching of science is as difficult to foresee as the untrod ways of science itself, the internal arrangements of a science building must be flexible and capable of adaptation to any new avenue of study that may open at any time. If it is recommended that academic buildings have their transverse partitions capable of easy changing, it is all the more important that they should be so in science buildings. The best lighting, both natural and artificial, must be supplied for microscopy and dissecting.

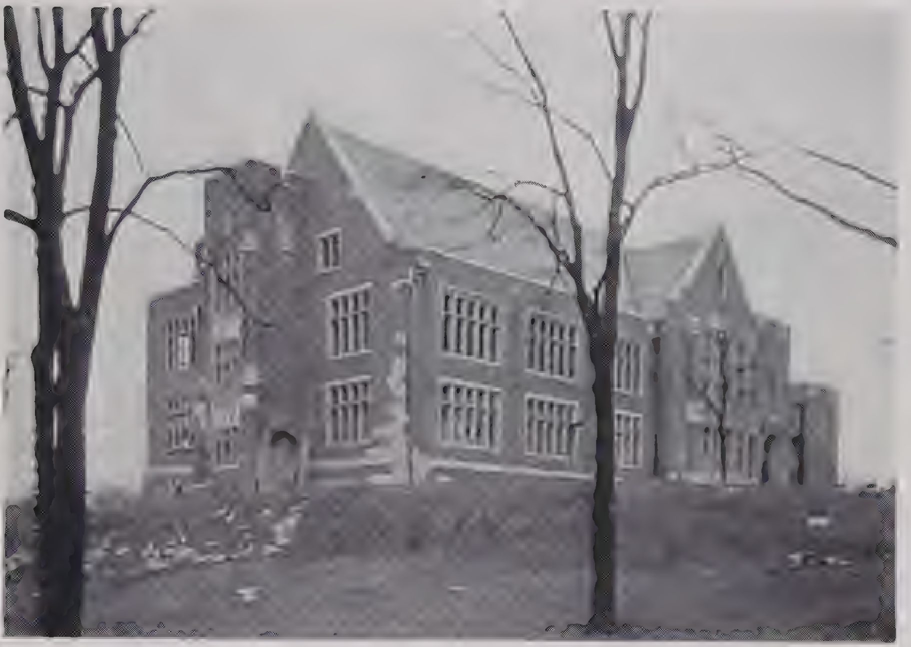
In small buildings serving simple needs and small groups of students the difficulties encountered by the architect with the fenestration are slight compared with those commonly faced when the building contains large laboratories with many rows of free-standing tables in addition to those attached to the walls. It is a reasonable demand of the teaching staff that the fenestration should follow and be in accord with the table spacing; but after this is agreed on, the architect should be given scope in the design of the windows themselves, for great expanses of undivided glass, as the professors invariably demand, are absolutely incompatible with an exterior that is other than ordinary, commercial looking and banal. With a little understanding of the other person's point of view and a sympathy with his aims, horns may be unlocked over this trying question and a satisfactory middle ground reached in peace and amity. Furthermore, it is a common experience of architects to enter buildings when they are in use and find workers in rooms with shades drawn, even on cloudy days, thus reducing the light from windows that in the planning of the building were demanded to be boundless expanses of uninterrupted glass.

There must be an effective system of artificial ventilation, including air-washers for all laboratories, and for the fume hoods of laboratories a fan system must be installed. In a small building the fan can be an individual one for each hood and operated at will. Special facilities must be provided for the storage of fragile glassware, valuable instruments and many chemicals, some of which are very costly, destructive or dangerous, or all of these. Dangerous storage is best arranged in an underground vault outside the building, reached by a tunnel from the basement. Especially elaborate must be the service lines that provide nearly all the laboratories with abundant washing facilities such as sinks, with hot and cold water and their wastes,—chemical wastes must have acid-proof drain lines of their own,—with electrical current of varying and easily controlled quantity and quality and with gas, steam, air blast, vacuum and distilled water through outlets at every work table.

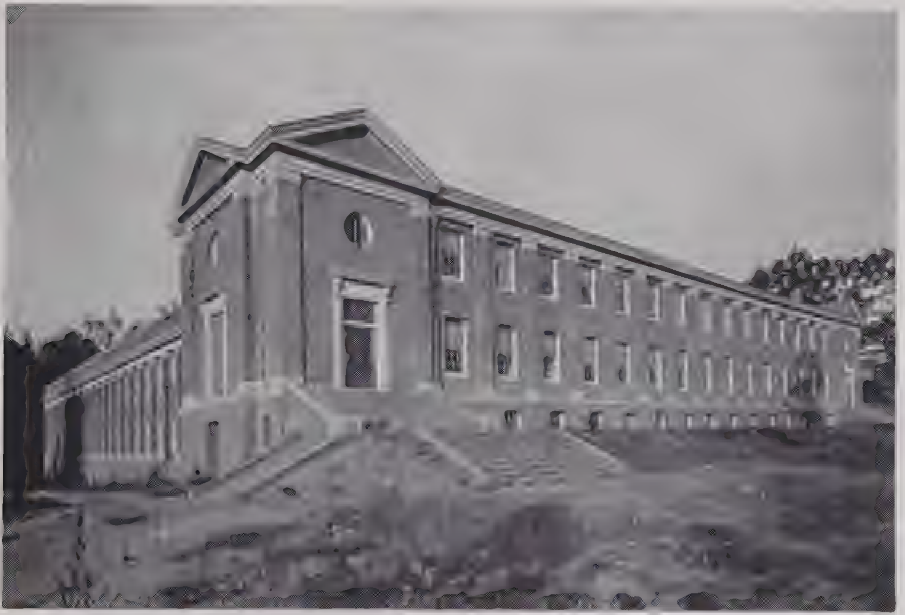
A thoroughly modern science building will have installed at equidistant points lines of pipe and conduit supplying these utilities so that connections may be easily made from time to time to serve new apparatus, changes in demonstration or research, or the subdividing of rooms or classes. Similarly there will be installed a vent duct running the length of the building, through the rooms and at the ceiling on each side of the central corridor. With this duct exhaust pipes from new equipment or as required by new activities in the rooms may be connected at any time.

Vitiated air from large lecture-rooms may be expelled through vents contrived in the cast-iron standards of the chair seats. There must be window curtaining to permit the complete darkening of the room at will, preferably by electrical mechanism with the control at the lecturer's table. Artificial lighting should be general throughout the room and also capable of being concentrated upon the lecture table and blackboard behind it. This can be effected by ceiling pendants shaded on one side only or a row of lights like the "border lights" above a theatre stage.

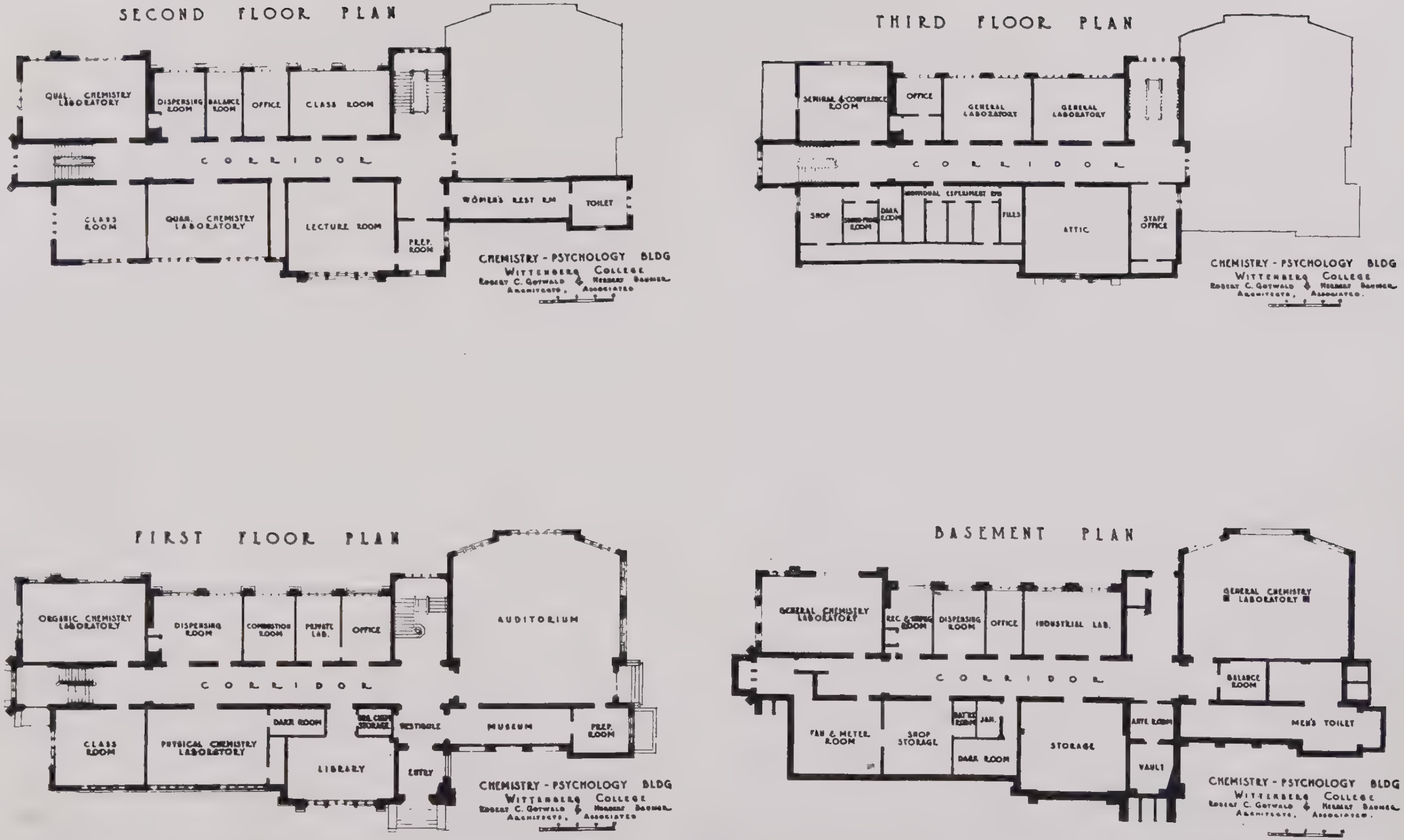
There should be a soapstone sink in every room of the building except the general office, the museum and the library. In all laboratories where any chemical analyses are made (embracing other laboratories than those for chemistry alone) there should be at least one fume hood. Every laboratory should have one wall blackboard, but in lecture-rooms and classrooms more blackboard surface is needed. In large lecture-rooms with sloping tiers of seats blackboards are sometimes placed across the rear (highest) end of the room for the use of the students. There should be provision for charts and maps to be permanently displayed or drawn down at will from neatly enclosed reels secured to wall or ceiling.



CHEMISTRY LABORATORIES, WITTENBERG COLLEGE.
ROBERT C. GOTWALD AND HERBERT BAUMER, ARCHITECTS, ASSOCIATED



VENABLE HALL OF CHEMISTRY, UNIVERSITY OF NORTH CAROLINA.
ATWOOD & NASH, INC., ARCHITECTS; McKIM, MEAD & WHITE, CONSULTING ARCHITECTS



PLANS OF CHEMISTRY LABORATORIES, WITTENBERG COLLEGE. ROBERT C. GOTWALD AND HERBERT BAUMER, ARCHITECTS, ASSOCIATED

Encumbering corridors in any manner can only be deplored and on four salient counts. It narrows the effective width of the corridors; it looks unsightly; objects displayed there can never receive the necessary amount of natural light; and they must be protected from a maximum of dust. Exhibition cabinets, storage cases or lockers in corridors can only be interpreted as a confession of an afterthought, or the result of bad planning or overcrowding. They should be preferably in rooms especially arranged for them or otherwise in enlarged spaces, alcoves or amplified stair landings at the ends of corridors, where they cannot encroach upon the floor space needed for free circulation and where they will have a reasonable amount of natural light.

Lockers are an essential for the change of costume necessary before the student enters a laboratory, and commodious locker rooms in the basement should meet this need. A small machine shop is needed for repairing microscopes and other instruments.

The reading or reference room of a science building contains the special library for the particular studies accommodated. It is, in fact, the departmental library[1] so much discussed by librarians generally.

A vital content of any science building is apparatus and equipment, and this must be taken into account in planning the building and in making up the budget of its cost. The teaching staff will specify the needs of this equipment; and as no sensible architect will aspire to so abstruse a knowledge as this involves, his task will consist of coordinating these technical demands and to reconcile them with that architectural quality with which he seeks to inform his structure.

The major part of what is loosely called "equipment" consists of what is, properly and accurately speaking, *laboratory furniture*, that is to say tables, desks, storage and exhibition cases, chart and map frames, blackboards, counters, railings and gates, the structural portions of fume hoods, stands of drawers, desks and the like. The remainder of "equipment" comprises special sinks, tanks, mechanism, apparatus and instruments, many of which are manufactured complete in themselves, and therefore the architect need only prepare for their installation and leading to them their various service lines. Steel furniture would seem to be making rapid progress in supplanting that of wood, but some experts point out that, in chemistry laboratories at least, steel furniture has not yet demonstrated for a sufficient length of time its superiority over wood with respect to being proof against fumes and acids.

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[1] A library so termed may consist of the special library of a department of a college or that of a college of a university. If the university is a large one and the reading-rooms of the constituent colleges are open during all the hours that the main library is open, and if the titles in the department library are also in the catalogue of the main library, the difficulties of administration often encountered by the chief librarian disappear.

Tables will extend along the exterior wall and hence under the windows of private laboratories, but in the general or class laboratories they will be placed at right angles with the exterior wall, so that the maximum of daylight can reach each student without being in his eyes. To this end general laboratories lighted from one side should not exceed 20 feet clear depth, assuming the ceiling to be the average clear height of 12 feet or 12 feet 6 inches. In a laboratory for microscopic work only, the tables should be the ordinary height of 30 inches. If 4 x 13 feet they will accommodate four students on each side. Each place must have concentrated artificial light. In this simplest kind of laboratory there should be a soapstone sink or two and a blackboard, a chart rack and a shallow exhibit case. The floor of this room may be of maple like that of the offices; but for other laboratories the floor should be cement, or better, cement covered with an ⅛ inch layer of "mineral gum" or "mineral mastic" as some of the recent products are called having for their base blended hydrocarbonates of Utah and elsewhere. Asphalt one inch thick and containing a hardener has at some places been found satisfactory.[1]

The study of geology requires less technical equipment than any of the other natural sciences named above, and it makes comparatively few special structural demands upon the building. It includes mineralogy and petrology and the work is chiefly with blow pipes, microscopes and other small portable instruments. A megascope and other large apparatus may require only an electric light outlet, but there is opportunity for ingenuity in locating and designing cases for specimens, and for lantern slides, topographical maps and models. An electric light below a pane of ground glass let into a counter top aids the identification of lantern slides. A weathering platform should be provided on the roof of a building or wing in which geology is taught.

Geology will rarely need a large building of its own unless accompanied by its cognate branches, mining, mine engineering and metallurgy. All these branches are highly developed at institutions situated in states having rich mineral resources, *e. g.*, Pennsylvania, Illinois, Colorado, Nevada, California and Washington.

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[1] Professor Chas. Baskerville of the College of the City of New York wrote on this subject in *Science*, Vol. XXVIII, No. 724, November 13, 1908: In my opinion the best which has been put forward is that which is known as lithoplast, devised by Doctor W. L. Dudley, of Vanderbilt University. It is essentially a paraffined sawdust sand floor, with a magnesia cement. This flooring may be laid in any length and in one piece, and offers many desirable qualities. The baseboard may be made as a part of this floor. There are no cracks. The presence of the sawdust allows of its expansion and contraction with changes of temperature, and the coating of paraffin over it prevents its rotting or napping, which are the objections put forward in opposition to composition floors containing sawdust. It may be tinted, polished, washed or scrubbed. It can be repaired without having cracked joints, and, furthermore, it allows nails and screws to be driven into it in much the same way that wood does.

Buildings for this specialized teaching must contain laboratories and balance rooms for assaying, metallography and general metallurgy. The metallurgical equipment will include furnaces, pyrometers, electrolytic and amalgamating apparatus, blowers, calorimeters, and sampling machines and special balances. The mining equipment will include air compressors, rock drills, aerial trams and provision for the demonstration of mine ventilation, health protection, the use of explosives and machinery for testing. Ore-dressing equipment will consist of breakers, crushers, rolls, feeders, sizing trommels, jigs, concentrating tables (12 or 15 feet long), flotation cells, magnetic separator and the like. It may be, too, that the Geological Survey of the state must be accommodated in the building. An abundant water supply is necessary.

STEELE HALL OF CHEMISTRY, DARTMOUTH. LARSON & WELLS, ARCHITECTS

Below are given the facilities needed in a building constructed especially for zoology and in one for botany. It will be seen that many of the rooms duplicate themselves, and that if these two studies should be combined in one building as a department of biology, the two lists would ordinarily merge into one much less extensive than the sum of the two as here set forth. The number of students to be accommodated, however, would have to be considered, the state university with 11,000 students, for example, having different problems than the private one with one-fourth that number.

BOTANY

Department offices.
Six or eight general laboratories (each large laboratory with a preparation-room adjoining).
Large horticultural laboratory.
Large physiological laboratory.
Several smaller laboratories.
Several research laboratories.
Eight or ten small rooms each serving as a private laboratory (professors' offices).
Museum.
Large lecture-room with adjoining preparation-room.
Small lecture-room.
Several classrooms.
Department or special library.
Drafting-room.
Herbarium.
Drying and pressing room.
Fumigating-room.
Constant-temperature room.
Chart-room.
Photographic room.
Dark room.
Student and staff rest-rooms and lavatories.
Precision-room.
Stock-room.
Shop.
Tool-room.
Receiving and unpacking room.
Incinerator-room.
Greenhouses.

ZOOLOGY

Department offices.
Several animal biological laboratories.
Vertebrate zoology laboratory.
Genetics laboratory.
Histology and embryology laboratory.
Physiological laboratories.
Metabolism laboratory (each large laboratory with a preparation-room adjoining).
Several smaller laboratories.
Several research laboratories.
Eight or ten private laboratories (professors' offices).
Large lecture-room with adjoining preparation-room.
Small lecture-room.
Several classrooms.
Demonstration-room.
Reference library and reading-room.
Photography and microphotography room.
Dark room.
Constant-temperature room.
Precision-room.
Cold-storage room.
Incubator-room.
Map-room.
Shop.
General-supply room.
Student and staff rest-rooms and lavatories.
Animal-room.
Aquaria.
Frog-tank.
Museum.

A room for macerating skeletons with an open platform adjacent to it should be provided on the roof at the head of the elevator shaft in a building or wing devoted to biology. The botany department will need abundant space in exhibition or specimen cases. Some of these will be 18 inches deep and extending from floor to ceiling. Laboratory tables 13 x 4 feet answer for 6 students. Electric outlets for light and power, both A. C. and D. C. current, and in wattage varying from 40 to 1,000 are required.

Concrete painted with a "liquid rubber" waterproofing has been largely used for the tanks of fresh and salt water in the aquaria. These should be arranged for breeding and for a reserve supply of specimens, and there should be observation-tanks, the latter provided with special artificial lighting that may be turned on for short periods. Small animals are kept in wire cages on portable stands of pipe frames and in a room with cement floor and a drain in the centre.

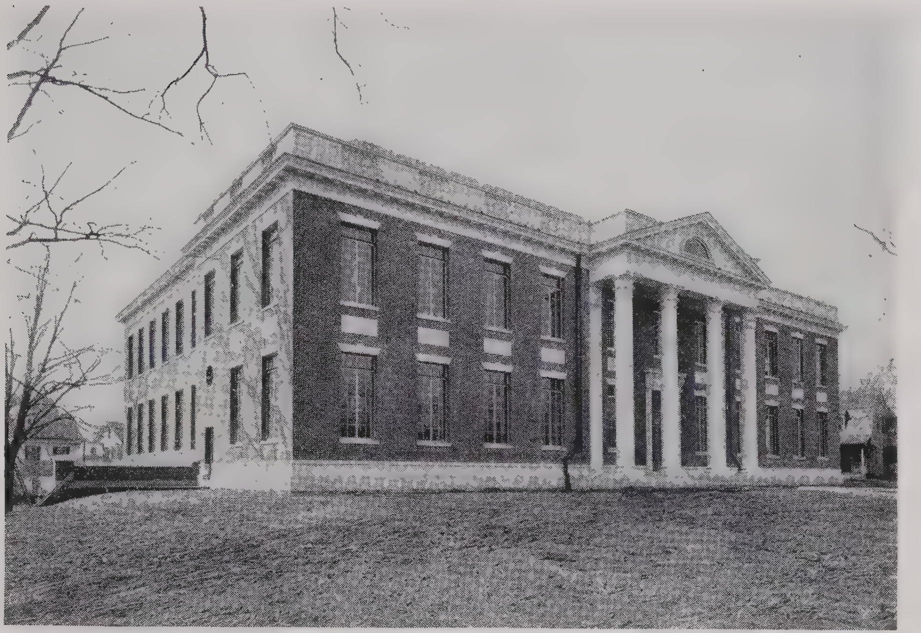
A building wholly occupied by the department of physics requires varied apparatus for the study of mechanics, sound, heat, light, electricity and magnetism, thermo-dynamics, radio-activity and the like. Such a building should contain the following:

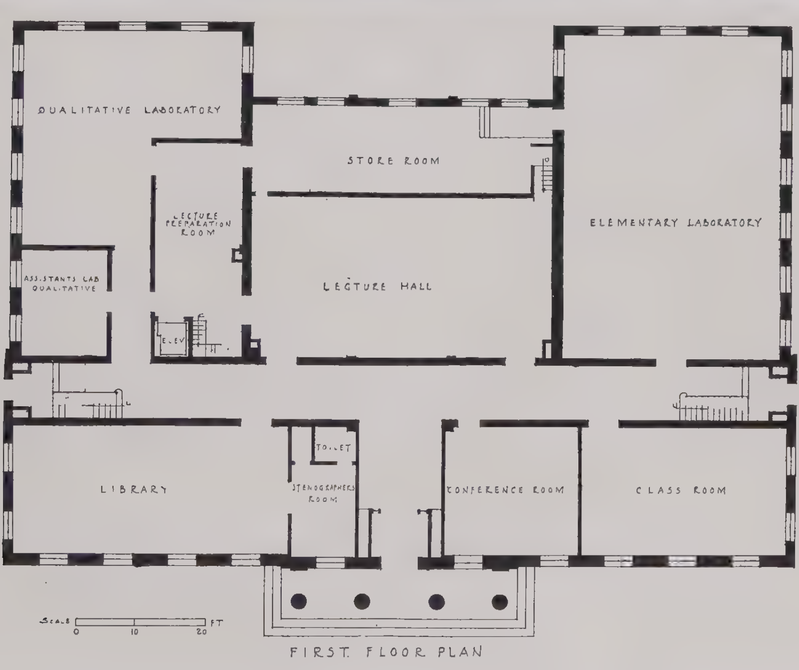
Department offices.
A number of general laboratories.
Library.
Spectrum laboratory.
General optics laboratory.
Small optics laboratories.
Sound-proof room.
Taste and smell rooms.
A constant-temperature room.
A number of research laboratories.
A number of private laboratories (professors' offices).
Apparatus-rooms beside each general laboratory.
A dark room for photography.
Low-temperature room.
A room for glass-blowing.
Storage-rooms for chemicals, glass and acids.
Shop with concrete island floor or platform.
Instrument-repair shop.
Unpacking-rooms, etc.

Over lecturers' tables there should be suspended from the floor structure above and about 10 feet below the ceiling a 6 inch I-beam about 10 feet long, on which various apparatus can be hung for demonstration purposes. Lecture-room blackboards are preferably made in two sections of equal size, one in front of the other and the front one counterbalanced so that it can be drawn down for use or thrust upward at will. Composition should be used for the writing surface, for even with the help of weights the shifting of the large sheets of real slate is none too easy, especially for women lecturers. The maximum number of seats which should be provided in the principal lecture-room is 250, and if there is a smaller lecture-room, this need not have more than 100 seats. Smaller suspended I-beams should be provided in the research laboratories, and all of these laboratories as well as lecture-rooms should have light-proof curtains, preferably rolling upward from the window-sills. The small optics laboratories (about 10 feet square) should be completely dark rooms without windows and with walls and ceilings painted black. If the soil is proof against the conveyance of vibration and there are no railroads or heavy teaming near by, a sound-proof room can well be constructed upon independent foundations and extending through the basement or even the sub-basement as in the new physics building at the University of Michigan. Under this count a one-story physics building, such as that at Iowa State College, has advantages but, on the other hand, it is in a higher one that a shaft for a Foucault pendulum or a polar heliostat can be easiest contrived. All work-rooms must be provided with storage battery connections and with 110 v. A. C. and 220 v. D. C. currents and water, gas and compressed air.

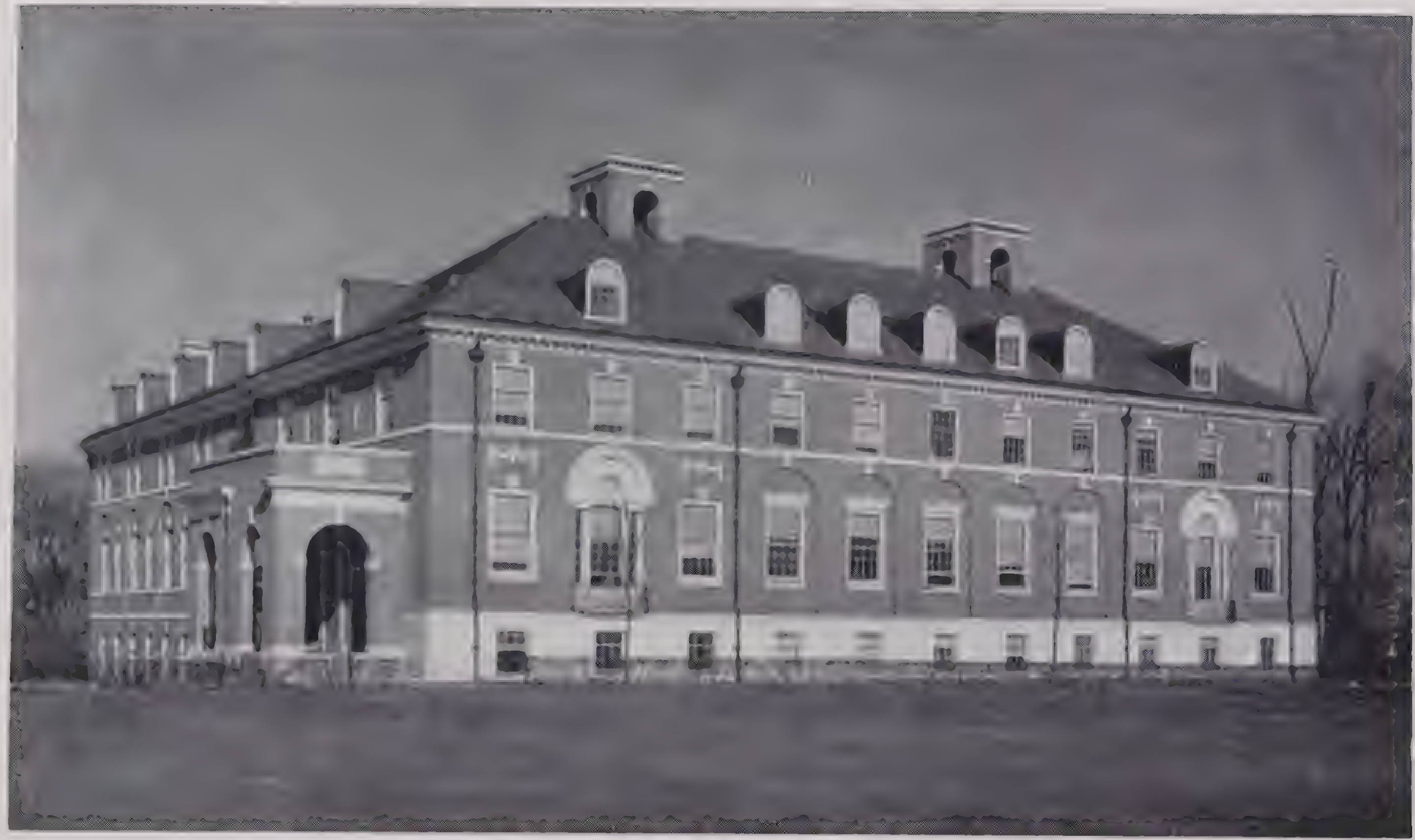
In planning a building for the study of chemistry the number and size of the general laboratories will have the largest influence upon the design. A small structure can be none other than rectangular in plan, but for a large one the E plan will probably be preferred by some, although there are good precedents for the large rectangle with two open courts and for the U plan. The problem of supplying the requisite number of rooms in relation to each other may induce the answer.

WILSON MEMORIAL HALL FOR THE DEPARTMENT OF GEOLOGY, WASHINGTON UNIVERSITY, ST. LOUIS. JAMIESON & SPEARL, ARCHITECTS



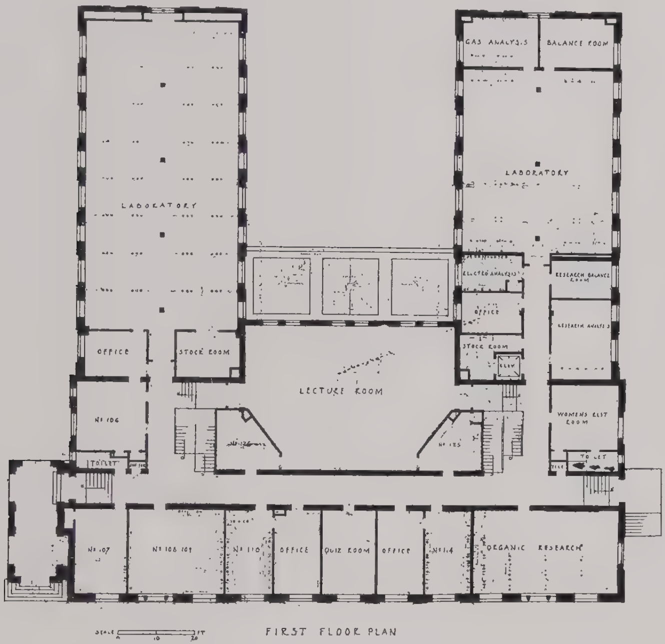


HALL LABORATORY OF CHEMISTRY, WESLEYAN UNIVERSITY.
McKIM, MEAD & WHITE, ARCHITECTS



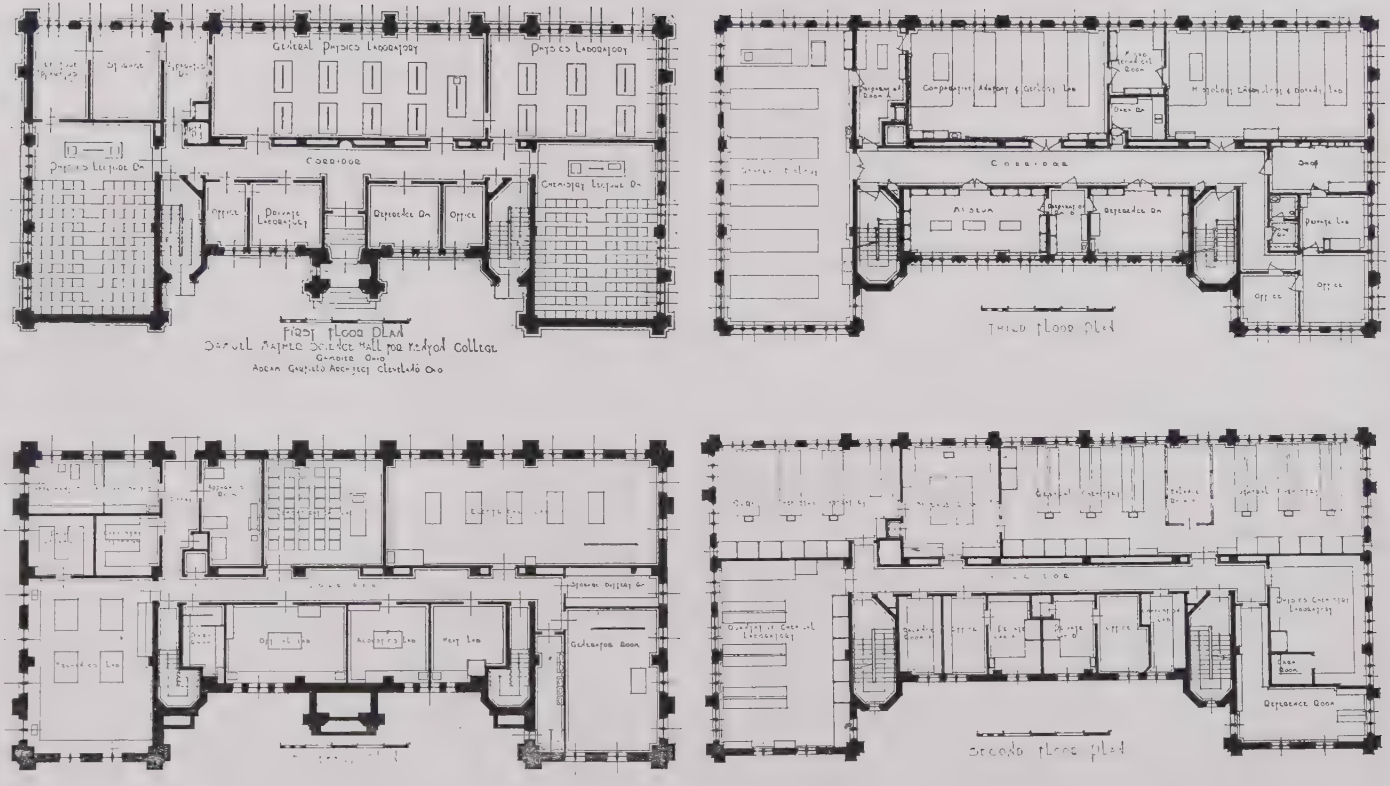
CHEMISTRY BUILDING, JOHNS HOPKINS UNIVERSITY. CARRÈRE & HASTINGS, ARCHITECTS

If there is a central corridor, it will be about 10 feet wide (or more if the daily population of the building warrants it) ; and with laboratories on each side, the overall width of the building should not exceed 58 or 60 feet to get the light from the windows into the internal side of the laboratories, unless the ceilings be of inordinate height. Some of the teaching staff will probably demand this to be 15 feet, but the architect, mindful of his cubage and heeding the limit of cost that has been set for him, will not make it over 13 feet in the clear. In many cases it will be made this distance from floor to floor.



FIRST-FLOOR PLAN OF CHEMISTRY BUILDING, JOHNS HOPKINS.
CARRÈRE & HASTINGS, ARCHITECTS

Laboratories for general and inorganic chemistry and quantitative analysis will probably be put in the first story, where the large lecture-room will also be located. Laboratories for analytical, quantitative and organic chemistry will probably find their place in the second story; and in the third will be those for physical and electrolytic and physical chemistry, gas analysis, spectroscopic and other special rooms and small laboratories for research. Adjoining each general laboratory will be a stock-room and the office of the professor who gives instruc-



PLANS OF SAMUEL MATHER SCIENCE HALL, KENYON COLLEGE. ABRAM GARFIELD, ARCHITECT tion in that laboratory. Near by should be a combustion-room and a room for generating H_2S. (Occasionally this malodorous production is confined to a room in the attic or basement.) Between or adjoining two general laboratories should be a recitation-room capable of seating that number of students who can work in each of the laboratories at any one time. This number some authorities put at 30, but this appears to be a rare ideal if we are to judge from the capacities of thrice that number found for the laboratories of even comparatively small institutions. Tables will average in width ~~5~~ 4 feet and the aisles 5 ~~4~~ feet. The table area is usually 30 per cent of the area of the room. Dividing room area by the student capacity gives 43 as the square feet of laboratory area necessary per student.

SAMUEL MATHER SCIENCE HALL, KENYON COLLEGE. ABRAM GARFIELD, ARCHITECT

The balance rooms are acceptable to some teachers if placed near the centre of the building and lighted artificially. This releases valuable periphery of the plan for naturally lighting other rooms. There should also be preparation-rooms near the general laboratories and in conjunction with the lecture-rooms. Of foremost importance is the one for the amphitheatre. This is sometimes satisfactorily contrived in the space under the stepped seats. In other cases it is found to be an internal room artificially lighted and ventilated; but as the lecturer must necessarily spend much of his time in this room,—which is a sort of shop and private laboratory combined,—an external position with natural light is desirable for it. The lecture table has been the subject of much study by those who use it and by architects. Tables on which experiments have been prepared are sometimes rolled into the lecture-room upon tracks or through openings afforded by a removable section of the partition between lecture-room and preparation-room. The seating capacity of the amphitheatre should be controlled by the distance of the farthest seat from which the operations can be clearly seen.

A constant-temperature room may be a small internal room placed near the centre of the building near the ground and with double-insulated doors. A polariscope-room and a bomb-room are sometimes needed. There should be a library with shelf space for 8,000 or 10,000 volumes and a reading-room with about 75 seats. A small museum and a sitting-room for students are found in comprehensive plans, and in the basement of any chemistry building there should be a shop, a room for storage battery arranged for variable voltages, locker-rooms, filtering plant, air compressors, fan and pump rooms.

The plumbing system should be visible and capable of easy renewing. Drain lines approved by experience at many laboratories are of high carbon cast iron dipped in heavy heated tar, these discharging into vertical chemical waste lines of glazed earthenware jointed with hot tar. If the laboratory tables abut against the side (exterior) walls of the room, it will be possible to run the piping along the wall, *i. e.*, through the ends of the tables and under the windows. This avoids suspending the piping from the ceiling below where, if the room below is a laboratory, dust falling from these pipes from time to time interferes with experiments.

Vitreous brick or matte-glazed terra cotta for laboratory walls has many advantages though criticised as acoustically bad; but white plaster painted with three coats of acid and sulphur proof paint, as formerly recommended, has now been superseded by some finished burnt clay product painted with "mill-white" or the like if necessary. All metal work must also be coated with an acid-proof paint. Ceilings of reinforced concrete construction should be painted, not plastered.

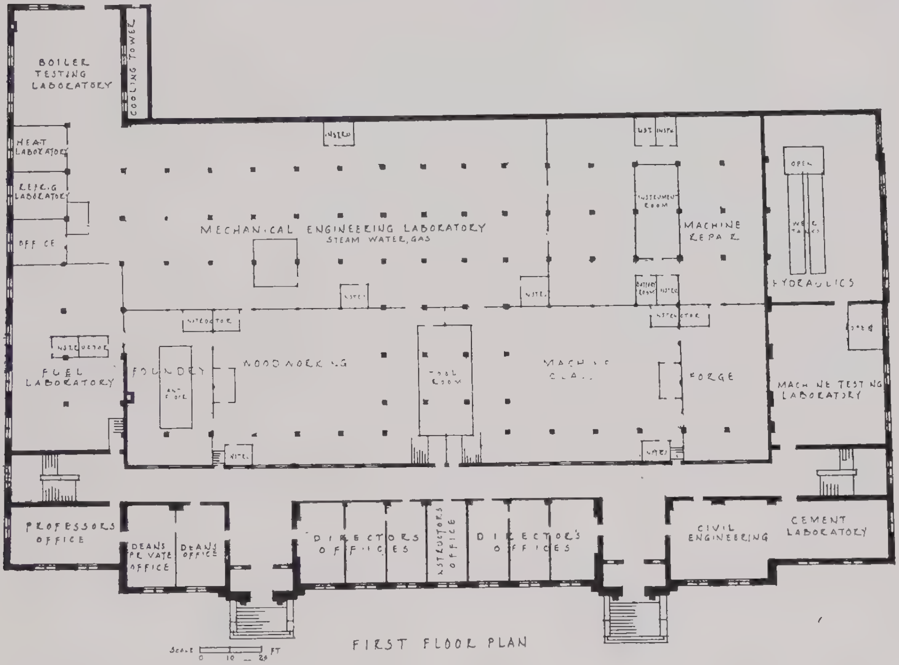
The part it plays in warfare having awakened great interest in chemistry in recent years, many new buildings for its teaching have been erected. It is doubtful, however, if any structures of the size of the Morton Laboratory of Chemistry, built 1906 at Stevens Institute, excel it in well-studied compact arrangement and convenient equipment; or if among larger buildings those at the Massachusetts Institute of Technology and at Michigan (1906) have been really outclassed The Mather Science Hall at Kenyon College is of recent date, and illustrates good planning for this special and exacting department of instruction.

CHAPTER XI

ENGINEERING BUILDINGS AND CENTRAL HEATING PLANTS

SPACE within buildings for the teaching of applied science and engineering is of two kinds, one distinguished by the needs of academic or classroom work, the other by the requirements of shops or laboratories. Those buildings or portions of buildings containing the classrooms, lecture-rooms, drafting-rooms and offices will in no wise differ architecturally from the academic buildings already considered in Chapter Four; but the buildings or parts thereof containing the shops identify themselves primarily by their large internal voids and high ceilings. These portions are more utilitarian in character than any building of the college or university save the central heating plant. This does not mean that the design of their exteriors need be given no consideration. Rather may it be said that a skilful architect can impart to them a very attractive and picturesque appearance, if not indeed entirely harmonize them with the main building. But on account of this dual character, it is often practicable in designing an engineering building to develop the administrative or academic portion as a head house fronting upon the campus and playing its part with the highly organized architectural design of neighboring structures, and to have the lower shop wings extend toward the rear and hence inconspicuous from the campus. This has been skilfully done at Baton Rouge where the ground falls abruptly in going outward from the campus level. On the other hand, if the location of an engineering building is such that all sides are equally conspicuous and perforce equally embellished architecturally, it may be necessary to place the shops within the general mass of the building, and then to set their floors 8 or 10 feet below the main first floor level in order to give them the higher ceiling without loss of second floor area, which would otherwise result by making the shops two stories high. This arrangement is found in the engineering buildings at the University of Pennsylvania and at Princeton. In the Electrical and Mechanical Engineering Hall designed for Lehigh wide galleries extend around the large laboratories at the second floor level, minimizing the loss of second floor area; and at Johns Hopkins the floor of Machinery Hall is level with the basement and the hall has a gallery level with the first floor of the building.

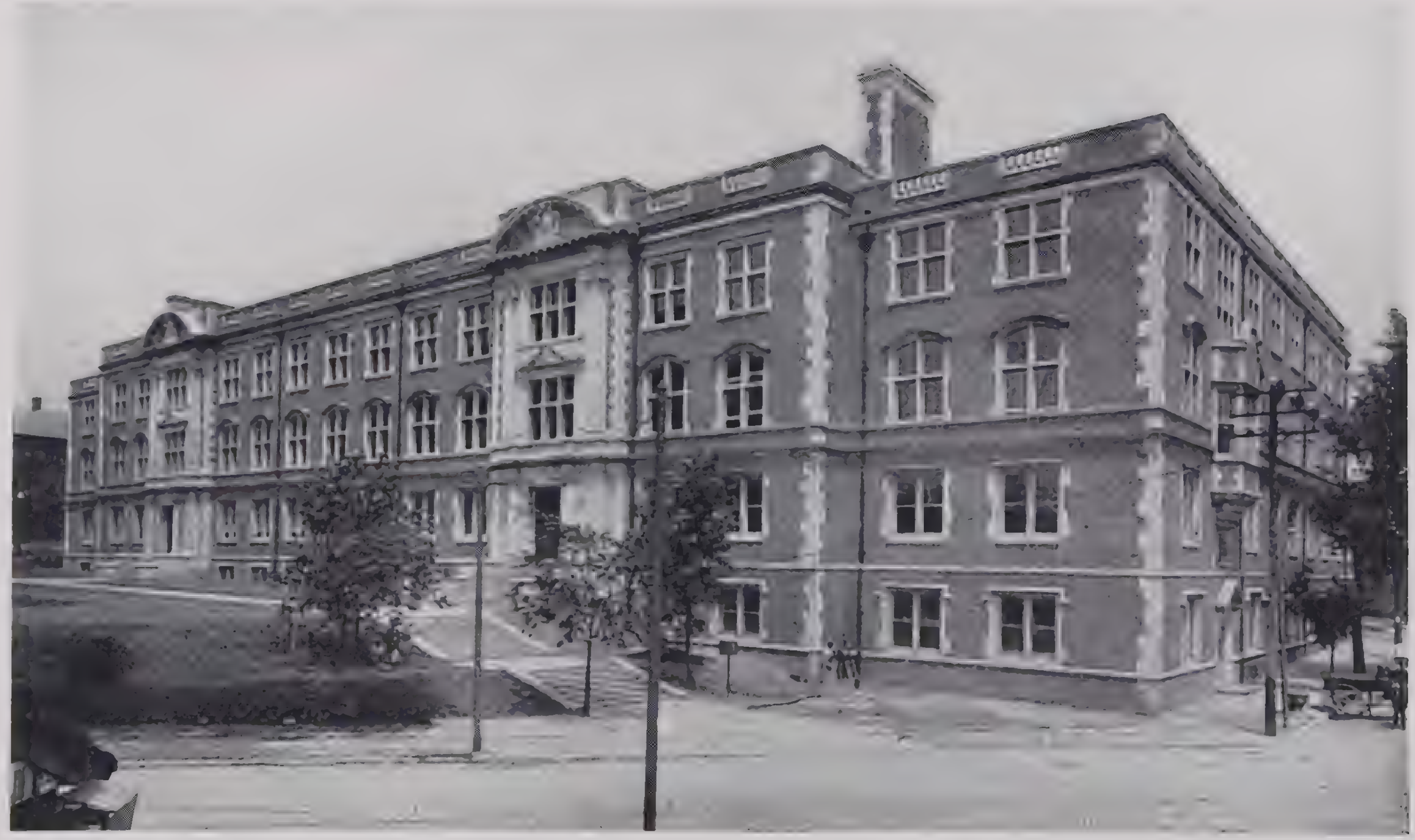
What we may term the "academic front" of an engineering building will contain the offices of the department, a large and a small lecture-room, rooms for classes of about 30 students and other classrooms seating 80 or 90, a departmental library, professors' offices, research laboratories, computation-rooms, rooms for special subjects and a number of drafting-rooms of varying sizes. Tables for drafting will be about 30 x 48 inches; and 26 to 30 square feet of floor area should be allowed for each student. The instructor's office must be within or adjoining the drafting-room. If in the room, it should be enclosed with a glazed partition.



FIRST-FLOOR PLAN OF ENGINEERING BUILDING, UNIVERSITY OF PENNSYLVANIA.
COPE & STEWARDSON, ARCHITECTS

A building devoted to *Civil Engineering* will require the following laboratories:

A hydraulic laboratory.
A structural engineering laboratory.
A road-materials laboratory for highway engineering.
A cement laboratory.
A railway engineering laboratory.
(A machine-repair shop.)



ENGINEERING BUILDING, UNIVERSITY OF PENNSYLVANIA

In certain localities the hydraulics laboratory will include facilities for irrigation engineering. It should be at the basement level and two stories in height. Extending the length of the room, which should be at least 50 feet, there should be a flume about 5 feet deep and 5 or 6 feet wide, constructed of concrete or of sheet steel surrounded by concrete. A platform rolls on the steel tracks that extend the length of each brink. At one end of the flume will be stilling-tanks, emptying into reservoirs from which water will be raised through piping of large diameter by means of a centrifugal pump operated by a motor. This piping and mechanism should of course be so arranged as to cut up the floor space of the room as little as possible. The room must also contain rectangular weirs so elevated as to have weighing-tanks under the orifices, also a cylindrical weir and a hydraulic ram. These must be elevated upon concrete foundations. An iron stand-pipe with a water gauge beside it, extending in a shaft to the roof of a building, has been condemned as an unnecessary expense, since principles can be equally well taught with a stand-pipe 10 or 12 feet high. If the laboratory is intended for instruction rather than research, it is desirable to have all of the apparatus so arranged that demonstrations of several kinds can proceed at the same time. For this purpose auxiliary flumes are recommended.[1]

The structural engineering laboratory will require foundations for the machines for testing structural materials under stress, impact or torsion. The railway engineering laboratory may likewise require foundations constructed in advance for heavy equipment. The road-materials laboratory will contain ovens, motor-driven rattlers, Olsen machine, abrasion and toughness machines and other equipment for investigating and testing of bituminous and non-bituminous road materials. The cement laboratory will be equipped with one- or two-man tables with water supply and ovens for the mixing and drying of cement. It will also have for cement testing considerable heavy mechanism requiring suitable foundations.

At some institutions all testing of materials is done in a separate building where the heavy apparatus needed is mounted on concrete foundations in large rooms with cement floors and high ceilings, where all water, steam and electric connections are provided and where the tests can be made without inconvenience or danger to more studious occupations or more fragile equipment. Such a building must be specially laid out and constructed if it is to have the complete testing equipment that is to be found, for example, at such institutions as Massachusetts Institute of Technology, Rensselaer Polytechnic or the University of Michigan.

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[1] Supplementing the study of hydraulics within campus buildings a number of institutions have stations upon natural water courses. The University of Washington has one on the shore of Lake Union. The University of Michigan has the Alexander Dow Hydraulic Equipment Flume beside the Huron River. The Worcester Polytechnic has the Alden Hydraulic Laboratory at Chaffins, Mass., and Cornell has a station in the ravine near the campus.

A building entirely devoted to *Mechanical Engineering* will require the following laboratories:

A machinery hall.
A machine-tool laboratory.
A metal-working and treating laboratory.
A foundry laboratory.
A woodworking shop.
A heating, ventilating and refrigerating laboratory.
An automotive laboratory.
A boiler and fuel economy laboratory.
A gas-engineering laboratory.
A marine engineering laboratory.
An aeronautical laboratory.
(A machine-repair shop.)

Ceilings of all laboratories should be at least 18 feet in the clear to provide for large machinery and apparatus, forges and their flues, ducts, foundry cupolas, exhaust fans and the like, but the ceiling of a machinery hall should be at least 25 feet high. As there are innumerable obstructions in machine-rooms to light coming from the side walls, there should be skylights in these rooms as well, in the form of longitudinal monitors or saw-tooth roofs. Brick unplastered walls containing anchorages at unit spacing for future attachment of apparatus or mechanism are recommended. All structural steel members should be exposed and that of upper works calculated with a factor of safety to permit the suspension of fairly heavy concentrated loads at any point and at any time.

The machinery-hall should have an overhead track and travelling electric crane by means of which heavy machinery can be raised, hung or moved from one part of the room to another. These tracks should terminate before a large doorway through which machinery can be brought into the building. This is especially important in laboratories specializing in research work or where testing of machinery is done for manufacturers.

Foundations, pits, flues, water-supply drains, steam connections, etc., must be provided for the various installations, such as vertical, horizontal, turbine, marine and oil engines of various simple and compound, high-speed and Corliss types, pumps, condensers, compressors and pulverizers, dynamos, vacuum machines and the like.

The machine-tool laboratory will contain lathes, planers, shapers, grinders, drill-presses and work-benches. Electric power will be used throughout with group and individual drives, but provision for some shafting or other overhead gear may be necessary.

The metal-working and treating laboratory will have hand forges with anvils, power hammers, electric and gas-fired furnaces, equipment for oxy-acetylene welding and the heat treatment of metals, possibly also a nickel-plating plant. Fuel bunkers should be provided at one end of the room and, under the floor, ducts to carry air for the forges and to remove smoke and waste gases, unless the ventilating system of the building calls for these to be removed entirely through overhead ducts.

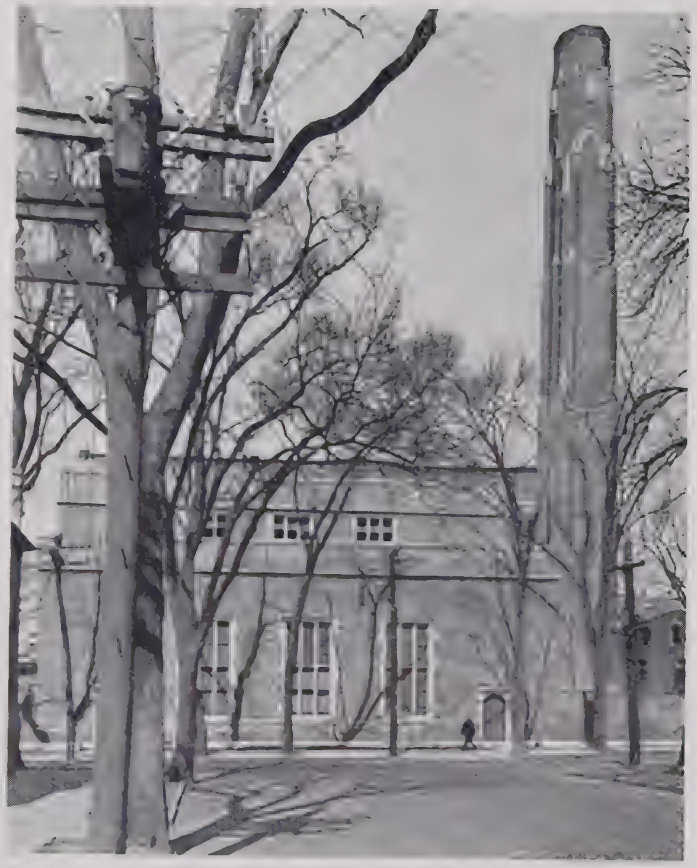
The foundry laboratory will contain an electric arc furnace, one or more cupolas, a crucible furnace and sand-blast machine, tumbling barrels and grinding stand, and an electric overhead crane. The architect must give special attention to the construction of the cupolas and to carrying the gases therefrom without detriment to any upper part of the building. There should be an electric elevator to carry materials to the cupola charging decks.

The woodworking shop is assumed to be a laboratory for instruction only and will contain benches, lathes, planers, band and circular saws, with facilities for pattern making. Near by there should be a fireproof room for the storage of patterns.

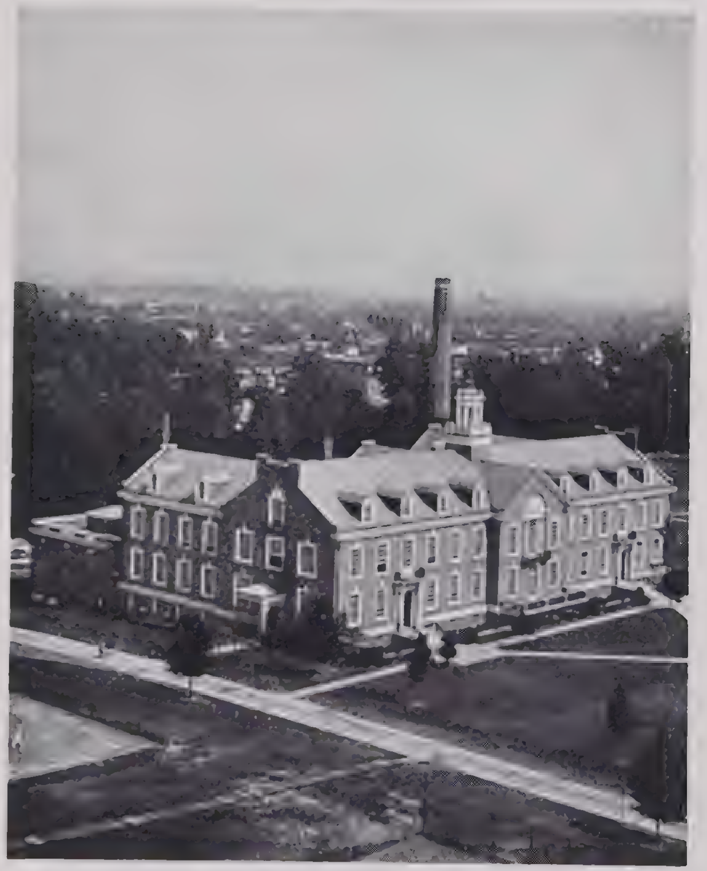
The heating, ventilating and refrigerating laboratory will have driers and evaporators, motor-driven fans, coil chambers and other special apparatus for conducting tests in heating and ventilation and drying, and it will have a complete refrigerating plant for experimental purposes. Refrigeration may indeed have a laboratory to itself and provided with upper decks, pits, etc.

The automotive laboratory will have pits and also tracks reached by inclines for examination of chassis and cars. It should have bedplates for securing in position numerous internal combustion engines.

In the boiler and fuel economy laboratory, boilers of various commercial and domestic types as well as household furnaces and ranges will be placed, having flues suitable to each and pits where needed. The chimney serving this apparatus will form the centre of the main stack of the building. The space between the chimney bore and the outer shell of the stack may answer for the discharge of the accumulated vent flues and exhausts of the structure. Instruction under this head will be supplemented by boilers located in the central heating



THE CENTRAL HEATING PLANT AT YALE



ELECTRICAL ENGINEERING BUILDING, JOHNS HOPKINS.
JOSEPH EVANS SPERRY, ARCHITECT

and power plant, a fact that proves the need of the mechanical engineering building being located close to this central plant.

The gas engineering laboratory will contain a small retort for manufacturing gas, a hydraulic main, condensers, tar extractor, scrubbers, purifier, tar and ammonia tanks and a gas holder, as well as apparatus for measuring and testing the finished product. It is advisable to isolate this from the main building.

The aeronautical laboratory must be provided with wind tunnels for aerodynamic work. The standard is 4 x 4 feet in cross-section. It must have a model shop, air blowers, and facilities for testing motors, the thrust and torque of propellers and of the lift, drag and centre of pressure of aerofoils. It should be near the marine laboratory so that students can make use of the naval tank.

The marine engineering laboratory will contain a naval tank about 300 feet long, 20 feet wide or more and 10 feet deep, with a false bottom adjustable at varying positions so that the speed of vessels can be studied with relation to the depth of water. The tank is spanned by a travelling-truck capable of being driven at any speed. Adjoining the tank should be a shop with apparatus for moulding and melting the paraffin wax of which the ship models are made.

A building entirely devoted to *Electrical Engineering* will require the following:

A generator laboratory.
A communication or transmission line laboratory.
A transformer laboratory.
A radio laboratory.
A photometric laboratory.
A storage-battery room.
An electrical measurements laboratory.
A telephone and telegraph laboratory.
A high-voltage room.
An electrolysis room.
A dynamometer-room.
An instrument-making and repairing room.
A stock-room.

Of these there are but few requiring advance provision in constructing the building other than accessibility at all points to the wiring system. In a modern building these feed lines are gathered into a number of vertical shafts spaced nearly equidistant throughout the building and wires led from these along the exterior walls below the window-sills and enclosed with wood or sheet-metal, making a cross-section about 4 x 6 inches. By removing the front of this continuous box apparatus can be attached at almost any point.

The generator laboratory should have embedded in the concrete floor two small I-beams forming a pair standing about 1 inch apart, so that a T-bolt can be inserted for securing the dynamos and motors to the floor. These pairs are repeated across the floor at about 30 inch spacing. This method of providing bed plates for securing dynamos and motors offers no projection above the floor level. The ceiling should be high and there should be an electric travelling crane. If there is a balcony, lighter apparatus can be placed there. The high-voltage room should have a high ceiling, and there should be railings or screens to prevent accidents to persons. The photometric-rooms used in connection with illuminating engineering should be in part internal rooms, preferably in the basement without windows and with walls and ceilings painted black. Along the floor tracks should be inserted on which the photometer is to travel.

If electrochemistry and electrometallurgy are taught, the laboratories for these will have apparatus for the electrodeposition of copper, nickel, zinc and lead and electric furnaces for experimental work in refining of steel and in producing alloys. Elasticity in the preparation of these furnaces calls for the use of fine clay, silica, chromite brick and similar materials that are proof against high temperature.

These studies merge to a degree with those coming under the head of *Chemical Engineering*. This branch should have general chemical engineering laboratories with various apparatus for experimentation on the unit basis of various manufacturing processes. Steam, gas, air, electricity and distilled water must be provided as in the chemistry building already described. Centrifuges, agitation machines, crystallizers, hydraulic presses, filters, filter presses, stills, solution and draw-off tanks, a gas and oil-fired pot furnace, a gas-fired muffle furnace, drying-ovens, an absorption tower, etc., etc., are some of the pieces of equipment for which space at least must be provided in the plan.

The evaporator laboratory of the chemical engineering department will require containers to be set 7 or 8 feet above the floor upon frames or platforms of structural steel footed upon concrete piers. The metallography laboratory will include a microscope-room, a camera-room, a dark room and a room for grinding and polishing. The cement laboratory will have a small rotary kiln for burning Portland cement. (The cement laboratory mentioned under highway engineering is confined to the uses of cement, not to its manufacture.) The pyrometric laboratory will have apparatus for high temperature effect and control. Other laboratories will be devoted to the technology of petroleum and motor fuels, and to that of paint and varnish.

We have already mentioned, page 181, the subject of mining engineering. That portion of it consisting of assaying may possibly find a home under chemical engineering. A row of melting-ovens is needed and a muffle-oven as well. The former are about 3 x 4 feet square and 4 feet high, the latter about 4 x 5 and 6 feet high. Both are of brick or steel with fire-brick linings.

A ceramics building will contain beside offices, drawing-rooms and library, a ceramic materials laboratory, a glaze laboratory and preparation-room, a pottery laboratory, a plaster-shop and casting-room. It should have, preferably in a wing, a down-draft and other kilns arranged to be fired with gas, coal or oil and the temperature subject to exact measurement and control. There will be air blowers, saggers and electric furnaces as well as pug mills, extruding machines, jolly-wheels and other mechanism for working, grinding and shaping the raw materials. While this building is primarily to serve the teaching of the technology of the silicate industries, particularly the manufacture of bricks and terra cotta, the æsthetic side will have added scope in the modelling and decoration of hand-made pottery.

At some institutions the study of all means of land transport is gathered into a transportation building in which there are, in addition to classrooms and drawing-rooms, shops for railway, highway and automobile engineering, and also facilities for the testing of locomotives and other vehicles. Connection with a railway line of standard gauge is implied and the scale of the structure somewhat determined by the size of the entrance that must admit these large objects. The overhead crane necessary to the building calls for heavy proportions of the structural framework.

Curricula affected by the natural resources and industries of the differing states of the union are reflected in the plant equipment of the universities. In regions where extensive forests yet remain, comprehensive laboratories for lumbering are to be found, in addition to the forestry stations which many universities possess. Notably at the University of Washington are the splendid fisheries laboratories, while at the opposite extreme of our country's latitude is the four-story model sugar mill with 4,000 feet of floor area at Louisiana State University.

In planning the laboratories we have been describing as parts of engineering buildings, the architect must realize the great diversity of the equipment they are to contain. For this they are primarily erected. In a teaching laboratory not only must the pieces of apparatus be laid out in it according to their size, but there must be kept in mind the proper clearance or surrounding floor area needed for groups of students satisfactorily to witness the operation of each. Guiding principles of design, in so far as practical needs are concerned, are stability, insuring absence of vibration, precautions against the extreme heat generated by some of the apparatus, the structural framework to be exposed so that present and future devices may be attached, and absence in the laboratories of any fine finish such as plaster or woodwork which is sure to be injured in the handling of large, rough and heavy objects. All floors should be of cement or of wood blocks, except possibly in woodworking shops, and floor drains must be frequently and effectively located with a view to unexpected as well as customary discharges of water.

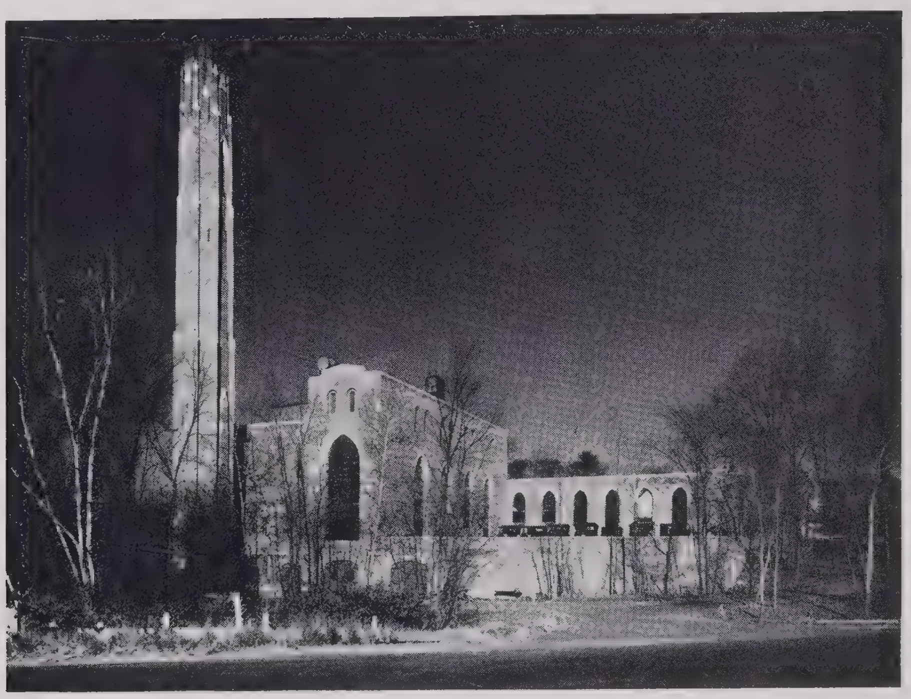
Central Heating Plants

The Central Heating Plant is the heart that give the pulse-beat to the institution. And it is more than that. In supplementing the teaching of mechanical engineering it plays an important rôle by presenting in its daily operation a valuable object lesson for study. For this reason the central plant should be, as we have said, a close neighbor of the engineering building. It is necessary to the teaching of heating and ventilating, where temperatures and movements of air by means of fans are observed; to the teaching of fuel economy, where boilers are investigated and tests made of everything that goes into a boiler and everything that comes out of it. The production and transmission of high-pressure steam and the average daily performance of pumps and other mechanism is demonstrated. Return condensation will be measured, different fuels tried and even the smoke and gases will not be permitted to escape without being intercepted and analyzed at one or more levels of the boiler-house stack. If electric current is also produced in the central heating plant, as it usually is, the generators offer an invaluable field to students of electrical engineering. If there is a pumping-station for artesian water supply, as at the University of Illinois, another very important engineering operation becomes available for study. If the institution is as fortunate as Cornell in having a hydro-electric plant, still another department of engineering is aided.

It is manifest that a central heating plant is chiefly an engineering problem. The selection and disposition of the boilers, the kind of fuel and its means of delivery to the building, its measurement and storage, the manner of preparing and feeding it mechanically to combustion

ENGINEERING BUILDING, PRINCETON

CERAMICS BUILDING, RUTGERS. FRANCIS H. BENT AND ALAN B. MILLS, ARCHITECTS



Photograph by Paul J. Weber

THE CENTRAL HEATING PLANT OF ST. PAUL'S SCHOOL

chambers, the discharge and removal of ashes, pre-heaters, induced draft mechanism and the like are in the hands of the consulting mechanical engineer who presumably has assisted the architect in planning other buildings. In this one the architect is to assist the engineer. A satisfactory architectural vesture is to be provided a huge and rather ungainly mass of mechanism. Nevertheless, there should be no cause for discouragement, for there is scarcely a limit to the happy outcome of architectural design when engineer and architect work in harmony toward that end.

The disparity in height between the low engine-room portion of a central plant and the portion holding aloft the coal bunkers is a condition that will be welcomed by the skilful designer, and none the less so will be the great expanses of windowless walls, so full of possibilities from the architectural view-point; likewise will be the lofty gables, the scale house and entrance gateway, the enclosing walls and lastly the stack towering above all. These give motifs for picturesque effects in any style, even though exact prototypes are not to be extracted from architectural folios. The levels mentioned as giving access to the stack may be marked by surrounding balconies or decks. These are to a stack what a "top" is to a mast, or else they suggest the minaret that Moslem architects have for centuries made a thing of beauty. Indeed, there is beginning to be an awakening to the fact that central heating plants may be made attractive and saved from the oblivion they have heretofore occupied. Their warmth was to be felt, but they were neither to be seen, smelt nor heard. With improved methods of operation and some interest shown in their appearance they are destined to rank higher than in the past in the architectural scheme of the institution. The ugly radial brick stack will wear an architectural apparel that will render it a landmark for which no apology need be made; and this will counteract in a sense the lowly position of the plant to which the law of gravitation and the habits of return condensation relegate it.

CHAPTER XII

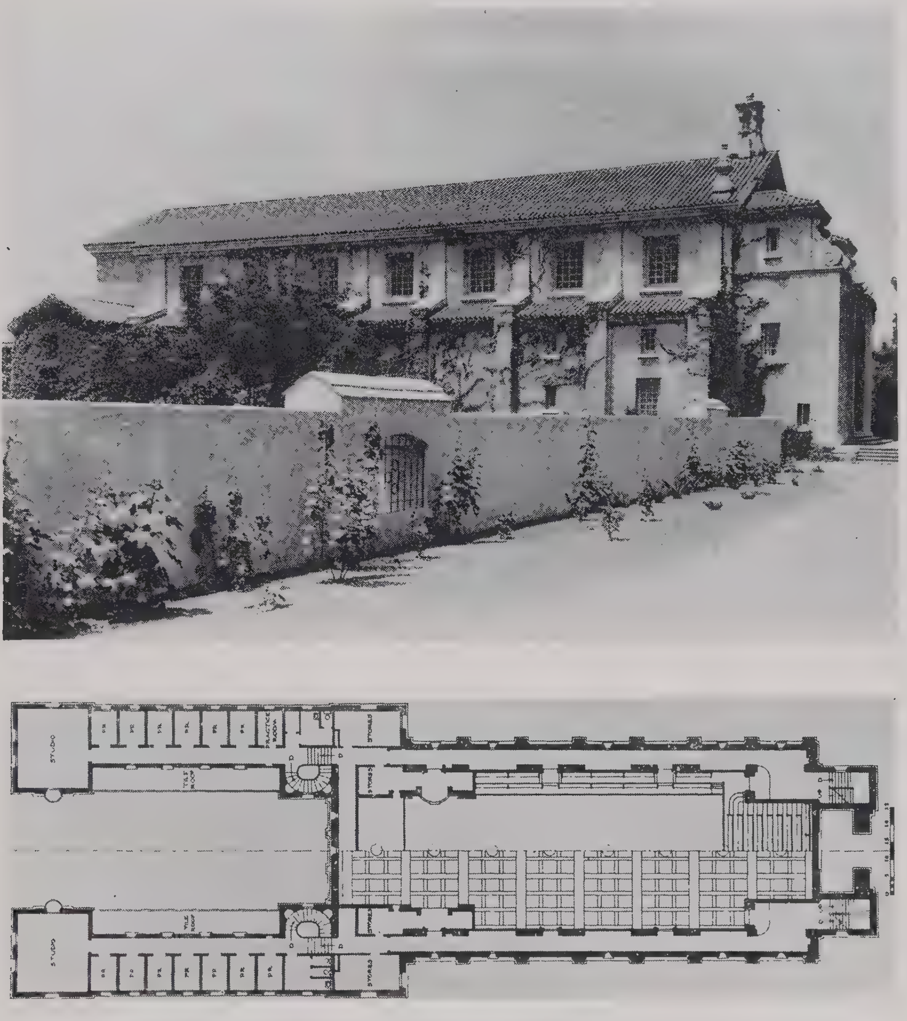
ART BUILDINGS AND MUSEUMS

During the development of a country engrossed in exploiting its resources of nature, the Fine Arts could not have been expected to occupy the place they deserved in college curricula. Was it not by providing colleges at which the chief stress was to be upon "agriculture and the mechanic arts" that one of the earliest steps taken by the federal government shaped the ends of institutions established or impelled by the Morrill Act? Zeal for the beautiful was probably repugnant to many as a preoccupation with what was inherently apart from the useful.

However we may theorize upon the past, it is borne in upon us that no branches of study are generally so inappropriately and inadequately housed at colleges and universities now as those of the fine arts. There are instances of this department being relegated to the oldest building on the grounds, to altered dwellings and to wooden structures where, under a constant hazard of fire, a collection of exhibition material—that necessary adjunct of art teaching—invites the visiting public. A strange irony of fate that the arts devoted to the beautiful should be housed in ugly buildings.

Music Buildings

Notwithstanding the great cultural value and universal appeal of music, it is only within the last twenty-five years that it has been recognized as an important part of school and college curricula. Not only does it entertain students and public, it welds the life of an institution together. It is the foster-parent of the instrumental and glee clubs, the orchestra, the band, the chapel choir, and it is an indispensable accompaniment to college activities. Not an indoor or outdoor event of moment but that the music department is appealed to for aid. Only a few institutions have erected buildings wholly devoted to music. Yet we are told it is possible to make a music department pay its own way if not, indeed, to render it a source of income. Concerts, recitals and the giving of private lessons are among the means to this end, the last named being especially feasible at the private institutions where choice of studies has a free rein and individual advancement along a given line receives the most encouragement.



THE BRIDGES HALL OF MUSIC, POMONA COLLEGE. MYRON HUNT, ARCHITECT

The studies of a Music Department at a large institution may be divided under three general headings:

The classroom teaching of music.
Applied music as expressed in the use of piano, organ, the violin and other string instruments, and the training of the voice.
Band, orchestral and chorus music.

In addition to these, the subsidiary functions and duties of the Department of Music should be taken into account in planning a building.

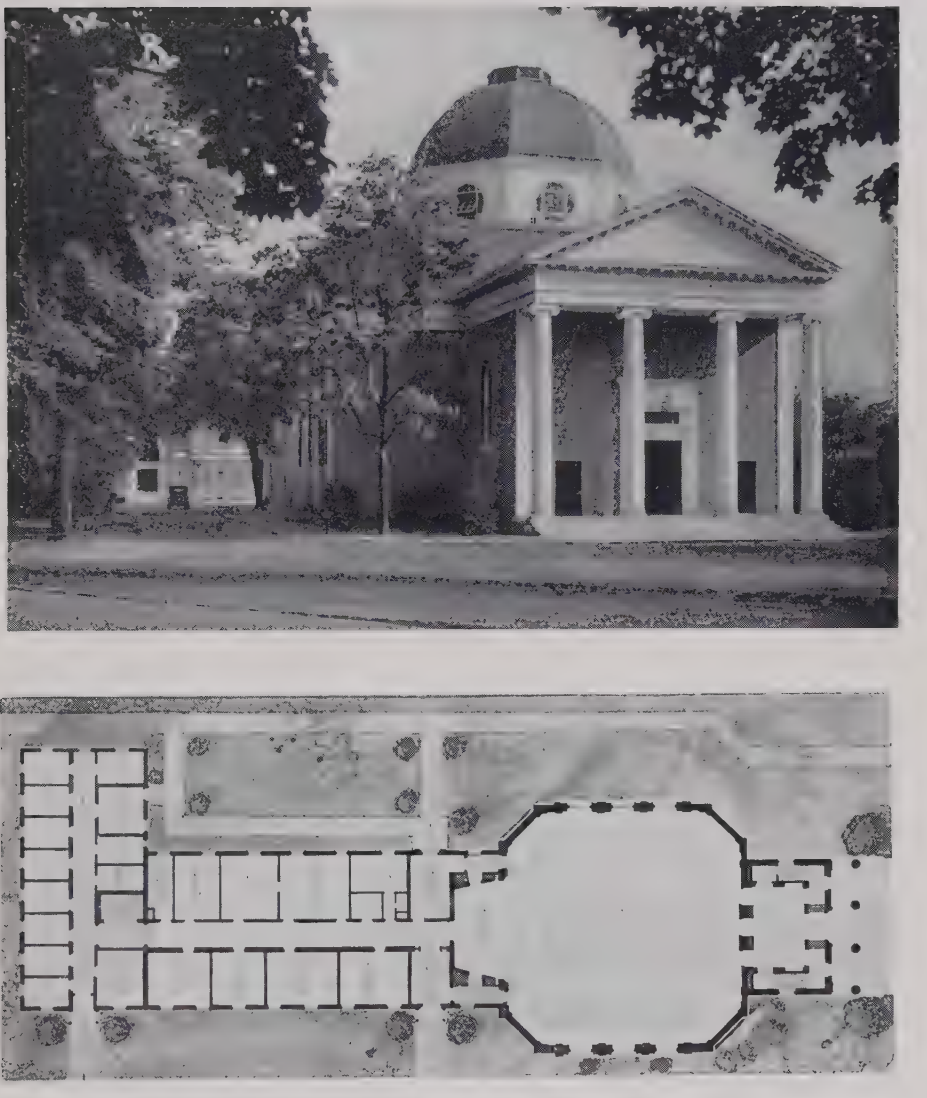
Classrooms should be provided for the teaching of musical history and literature, introductory and advanced theory and harmony, analysis, counterpoint, canon and fugue, composition, ensemble and pedagogical music. The only structural equipment necessary to these rooms are blackboards. Each board should have light lines drawn in white and forming the staff throughout its length and near the top. If æsthetic dancing and dramatic art are taught in the building, rooms must be allotted them.

Instruction upon the piano and violin and the organ, if small reed-organs are used, will require rooms about 14 x 16 feet. For voice training, about the same width, but somewhat longer, such as 15 x 20 feet. We were about to say that pipe organs can only be installed in chapels or auditoriums, but we have learned that some firms are making a small practice pipe organ, which takes up very little more floor space than a large reed organ and could go in a room 15 x 20 feet.

Rooms for band and orchestra rehearsals should provide 100 places, each consisting of a seat and music-stand. There should be sufficient space between each of these to insure perfect freedom to the performers of the various instruments; for instance, the string section should provide ample space for bowing, and in the brass section due consideration should be given to the trombone and other extending instruments. The room would of necessity have to be high enough to provide good ventilation and the proper reverberation of the sound. This room might also be used for chorus rehearsals, in which case 200 seats could be put in the same space since singers would not need so much room as performers.

Each professor in charge of important departments should have a small private office for consultations and he might have one smaller office for secretarial help unless the institution were large enough to have a secretary and assistants in a general office to take care of the work of the heads of the various departments. If the departments are large, the professor in charge of each would be better accommodated if he were to have a private room of his own which he could use as a study in addition to his consultation-room. The above remarks apply especially to instructors in applied music. Instructors in theory, public school music, harmony, history and the like,—if the school is large enough to have several teachers in this field,—can get along with small offices and two in a room.

The dean or director of the music school should have as an ideal

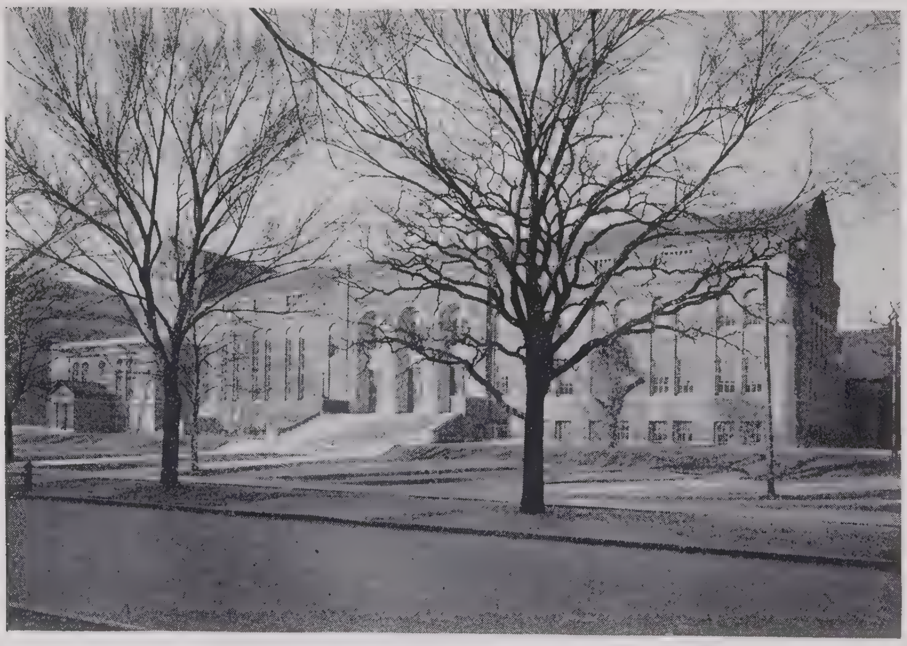


MUSIC BUILDING AT SMITH COLLEGE. DELANO & ALDRICH, ARCHITECTS

arrangement a parlor about 18 x 22 feet, and communicating with this a private office for himself and an adjoining small room for his secretary. Close at hand, if not indeed communicating with this suite of rooms, should be the classroom in which the director himself gives instruction.

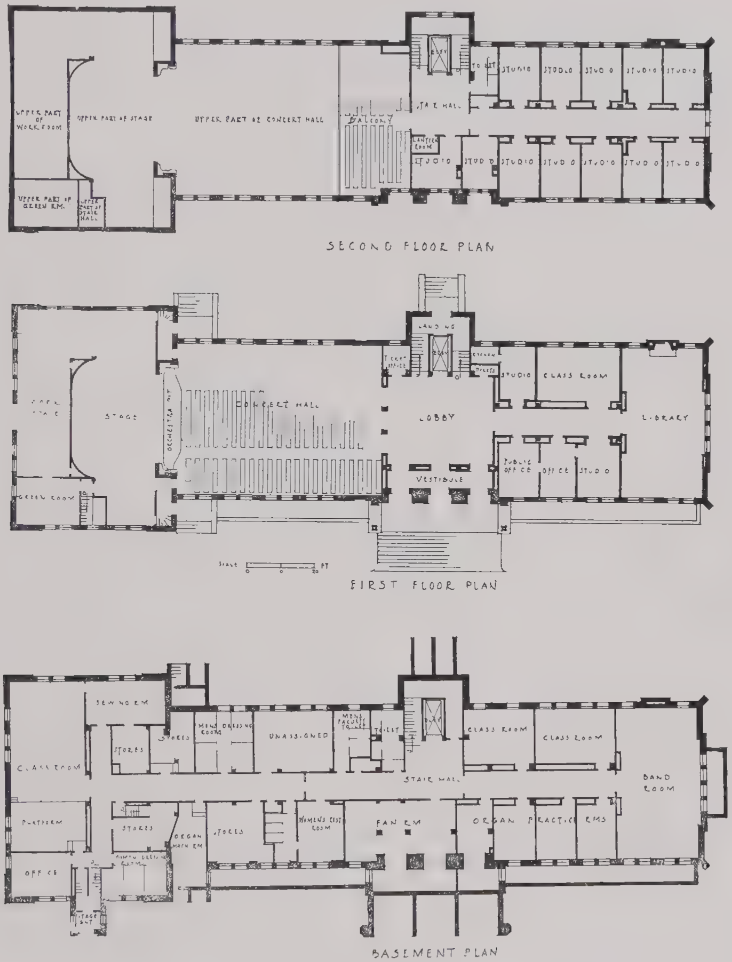
The administrative and clerical duties of the department must not be forgotten. At the entrance to the building should be a waiting-room; and reached from this, preferably behind partitions with ticket windows, space should be provided for clerks, some of whose duties consist of making out fee cards for private lessons, assigning practice-rooms for the different hours of the day, answering requests for teachers, looking after the arrangements for concerts and selling tickets.

A large number of practice-rooms of various types should be contained in the building, the number of these bearing a relation to the character of the institution. They should be placed, if possible, in the top floor of the building, and should be of the following approximate sizes: 10 x 12 feet for violin and string instruments, 10 x 16 for voice training, 15 x 16 for band instruments. A glee club can practise in a large classroom of the building. If not conflicting with the letter and spirit of building codes, some of the practice rooms at least might be placed over what is another essential element of the building, an auditorium or concert-hall. This should seat an audience of 1,200 or 1,500, if the institution and its community is populous, and it should contain a pipe organ.



MUSIC BUILDING AT THE UNIVERSITY OF MINNESOTA.
CLARENCE H. JOHNSTON, ARCHITECT

The concert-hall should be well proportioned, attractive in itself, with good acoustics and with inclined floor. The proscenium arch should be about 25 feet wide and from this to the rear wall of the stage not less than 28 feet. Under the front of the stage there should be a music pit, and there should be several dressing-rooms. If the stage is to be so built as to permit musical performances with a large caste, this stage feature of the building must be elaborated to a scale between that of the little theatre and of the commercial theatre seating 900 or 1,000. Other details are given in Chapter VI.



PLANS OF MUSIC BUILDING AT UNIVERSITY OF MINNESOTA

The library has an important part to play if it is developed so happily as in the Music School of the University of Minnesota. Not only is it the repository there of musical scores and books, this delightful room with fireplace at one end and lighted on three sides is in effect a drawing-room where receptions are given to visiting artists after recitals. Great value is naturally set upon these opportunities for students to meet socially persons who have risen to eminence in the musical world. In planning a building with this purpose in mind there should be a small kitchen or serving-room adjoining the reception-room.

There should be a small museum for the exhibition of ancient and

INTERIOR OF THE GOODHART HALL OF MUSIC, BRYN MAWR.
MELLOR & MEIGS, ARCHITECTS

modern musical instruments. The most valuable examples would properly be deposited in the main museum of the institution and, similarly, the most valuable musical manuscripts would be placed in the main library of the university. A high development of this museum feature, which might be contained in a music building of the future, is the well-known Stearns Collection of Musical Instruments containing about 1,500 examples at the University of Michigan.

A storeroom for the musical instruments used daily should be provided. At some institutions, however, the need for this is minimized as the instruments are signed out to the students.

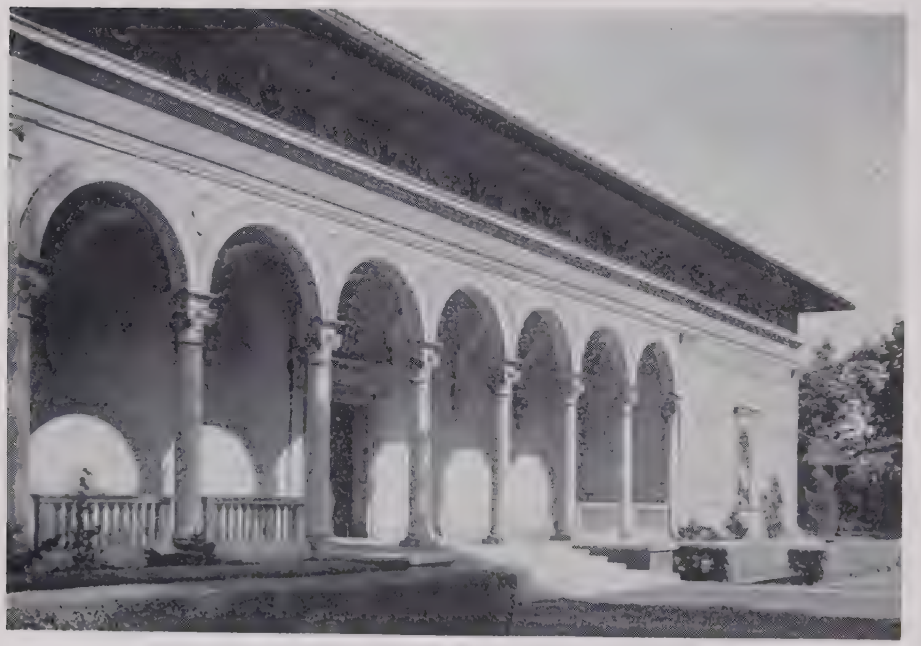
An elevator is desirable to take pianos to the practice-rooms on the top floor. If the building is not more than three stories high, this elevator may be of the hand-operated freight type, since it will not be used by students. It has been pointed out, however, that if strict economy is to be observed the pianos can be carried up to their places in the practice-rooms once and for all.

The foregoing outlines a liberal architectural programme for a music building at a large institution. It should, of course, be curtailed in proportion to lesser needs. The construction of the building should insure the confinement of sound to the room in which it is being produced. Ordinary plastering on terra cotta or brick suffices for the finish, but the partitions should be soundproofed within themselves by the introduction of strata of thick felt and also by an air space. Air space alone will not suffice, as the acoustical principle of a drum would prove. Specially constructed soundproof doors should be used throughout. It has been found advisable to apply felt insulation directly to the concrete surface of floors and ceilings in studios and practice-rooms.

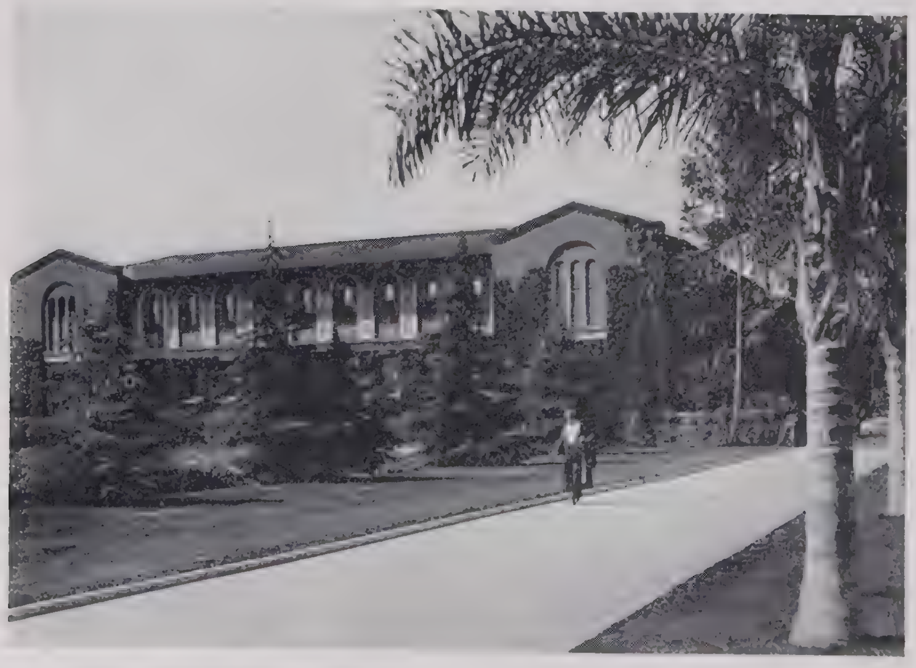
At least one director disapproves of any system of mechanical ventilation for a music building on the ground that it is impossible to prevent its permitting the transmission of sound from room to room and thus thwarting the purpose of insulation.

Buildings for the Fine and Applied Arts

At most colleges the teaching of Art is confined to history and appreciation. At some men's colleges there is no instruction at all under this head. It fares better at co-educational and at girls' institutions. Is this comparatively meagre attention given to a subject that touches life at so many points the result of colleges and universities having capitulated to the art schools and academies to be found in some of our large cities? The extensive facilities these special schools afford can only be supported by considerable centres of population, and hence places far removed therefrom must go without or create



ALLEN ART BUILDING, OBERLIN COLLEGE. CASS GILBERT, ARCHITECT



FINE ARTS BUILDING, UNIVERSITY OF CALIFORNIA, SOUTHERN BRANCH.
ALLISON & ALLISON, ARCHITECTS

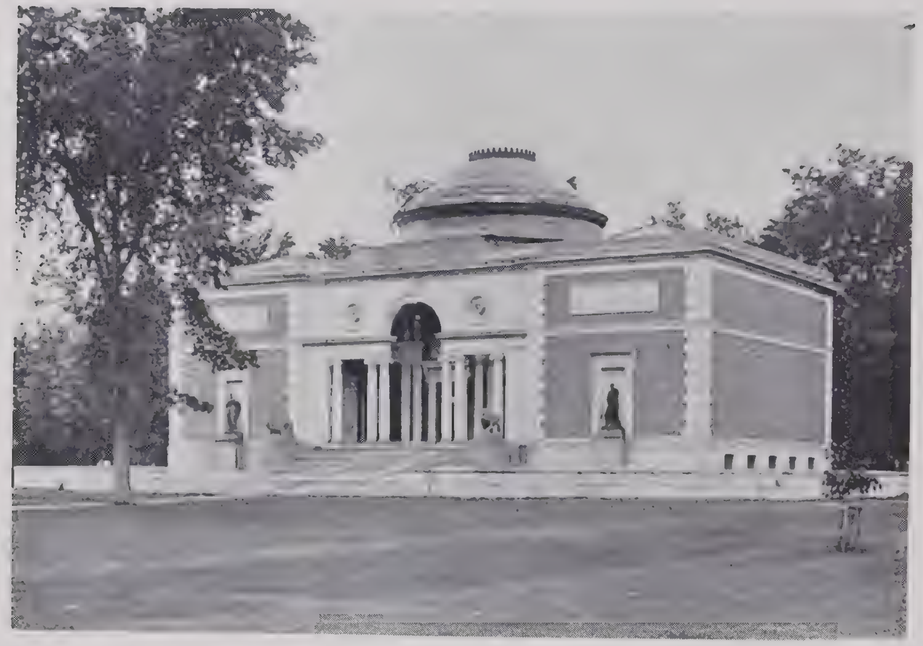
their own. Fortunately the latter course has been taken in some cases, and it is to be hoped these will in future greatly increase in number.

Those of the Fine Arts known as "The Arts of Design" consist of Drawing, Painting, Sculpture and Architecture. The first three of these are taught by illustrated lectures, by contemplation of examplars in the form of photographs or illustrations and by work in the studio.

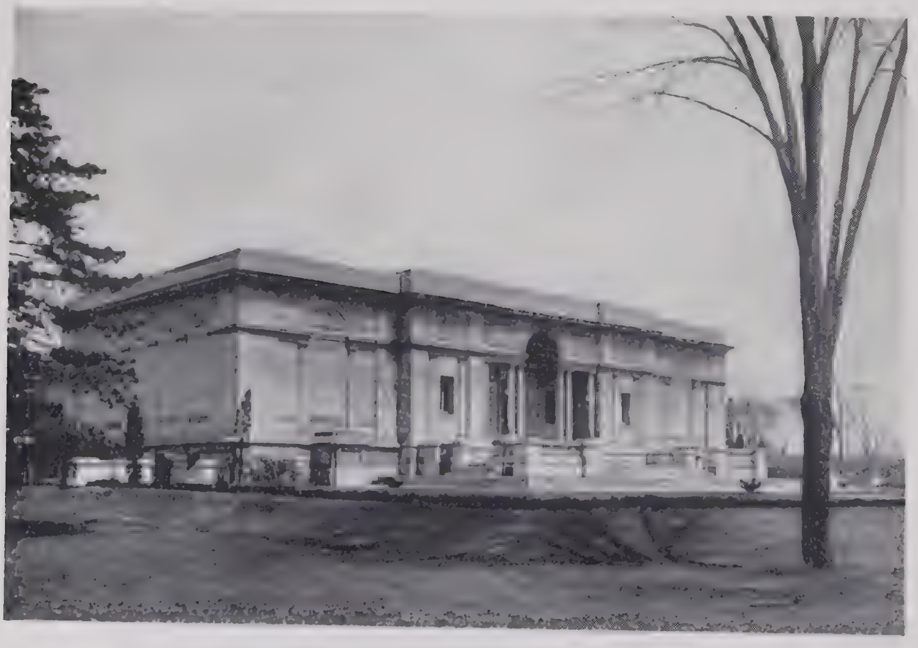
The facilities of the building should consist of a large lecture-room with inclined floor, and so well designed as to be attractive to the public as well as to students, for both will attend the lectures on art that will be given here. A projection-room is necessary, also a double stereopticon with double screen so that two subjects may be shown at the same time for comparison. Outside light is unimportant, but there should be an independent entrance and means of egress near the grade as called for by the best building codes.

A beautiful large room designed as an art library is another essential. Under this head there is not much more to be added to that given in Chapter Five except that provision must be made for many folio volumes which had best lie flat on roller-bearing shelves in wall or free-standing cases. Small in scale as this library will be, it may be intimate and charming in character, richly decorated and adorned with a few well-chosen objects of art.

An Exhibition Gallery is a third essential,—and perhaps there may be two or three of these; a Museum is a fourth. These will all have ceilings at least 15 feet high and probably will be lighted from the top, although there are advantages of other lighting for certain kinds of exhibits. Top lighting of the gallery gives the maximum wall space for hanging and will probably fit the most readily into the scheme of a compact comparatively small building such as we now contemplate. Care should be taken to have sufficient clearance between the roof trusses and the diffusing sash at the ceiling level that the trusses do not cast shadows. There must also be provision for cleaning the upper surface of the diffusing glass. Artificial lighting is accomplished by means of electric lights with reflectors placed above the diffusing sash and disposed after experimentation to give the best results. On the scores of intimacy, restfulness and homogeneity of exhibits several small galleries are preferable to one large one. Space may be gained for picture study by securing the pictures to large screens of diagonal mesh wire, the screens suspended on roller-bearings from tracks in the ceiling. These screens when in home position occupy about one-half the width of a long room, and one or more may be pulled out at will into the free half of the room for examination. This system of storage frames for pictures may be seen in the new Fogg Museum at Harvard.



WALKER ART BUILDING, BOWDOIN COLLEGE. McKIM, MEAD & WHITE, ARCHITECTS



MEMORIAL ART GALLERY, UNIVERSITY OF ROCHESTER.
McKIM, MEAD & WHITE, ARCHITECTS

It is possible under the urge of economy to place objects in loggias or corridors proportioned especially to receive them, or that some of these exhibits find a permanent place in the library or the gallery; but if the building is to be complete it should have both gallery and museum. Sculpture, exhibits in cases, furniture, models and other forms of museum exhibits are so varied in character that no one method of natural lighting will be ideal for all. For the two first named at least side lighting has been pronounced the best, that is with the window-sills above the eye level. Furthermore, this kind of lighting, being the most normal as it is, renders the museum more homelike and cheerful than if the light should come from a clerestory or from the attic height of the walls. The floor should be of oak, terrazza or cement and dark in color tone. Walls should be of a neutral color and neither floor nor walls should have a glossy surface reflecting light.

There should be an office for the head of the department and his secretary, a custodian's room and perhaps a smaller room or two for assistant instructors. There will be one or two small lecture-rooms or classrooms in which history, theory, appreciation and, possibly, art anatomy will be taught; and last, but by far the most important feature of the building, are the studios where practice in drawing, painting in oil and water colors and modelling is acquired. This divides itself into drawing from the cast, from still life, from live models, both for portraiture and the full length figure, and work in illustration and decoration. If the school is complete and classes sufficiently large, separate rooms should be planned for each of these. There might also be a studio for etching and the treating of plates. Special lighting should be contrived over the platform on which the model poses for the life class. Walls of rooms and hallways should be equipped to receive many framed illustrations at the eye line.

There will be a large collection of photographs mounted, indexed and arranged in cabinets for ready reference by students. Adjoining one of the private rooms should be the collection of lantern slides for use primarily of the faculty here or for lending to other schools. An electric light should be provided under a table to aid in quickly identifying slides, for the task of looking over great numbers of them to make a selection is arduous. As photographs and slides will probably be in steel cabinets, which are not ornamental of themselves, separate rooms should be provided for these collections.

If the art department is expanded to include the applied arts, additional work-rooms should be provided for weaving, book-binding, costumery, dyeing, leaded glass, embroidering, wood-block engraving and printing, leather tooling, batik, work in silver and other metals. Pottery is of such importance that we have already suggested quarters for it in the ceramic building; but it would be more appropriately housed here, were it not for its rather untidy materials and equipment.

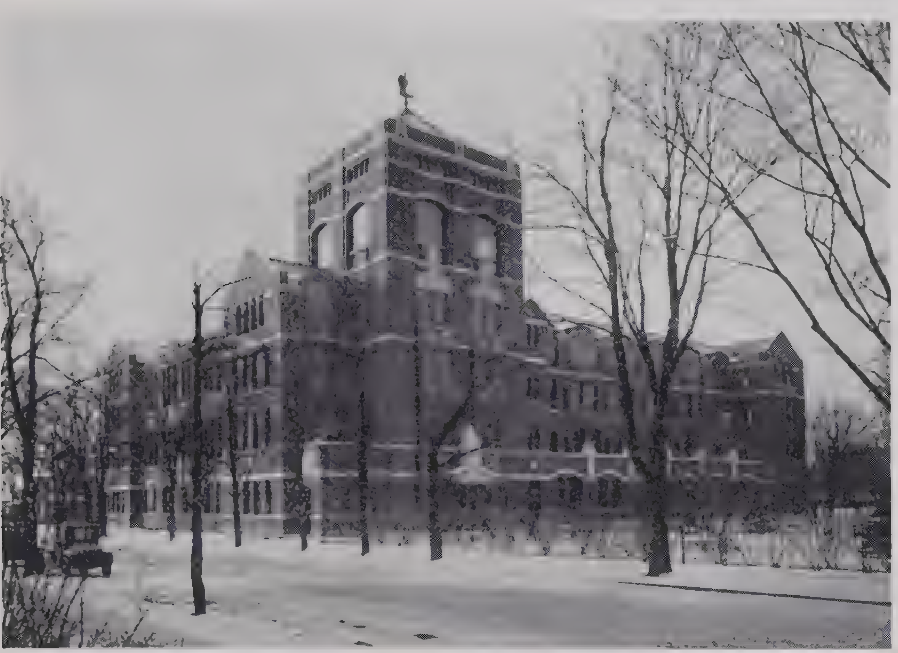
A room for the students' art club or society must not be forgotten; if the building is to serve its fullest use as the home of students who are apt to be as critical of their surroundings as they are appreciative of the beautiful. And these surroundings are to be the background for student dances which costume and pageantry would hardly make complete without brief moments of functioning by a small kitchen that a considerate architect would tuck into his plan.

Buildings for Architectural Schools

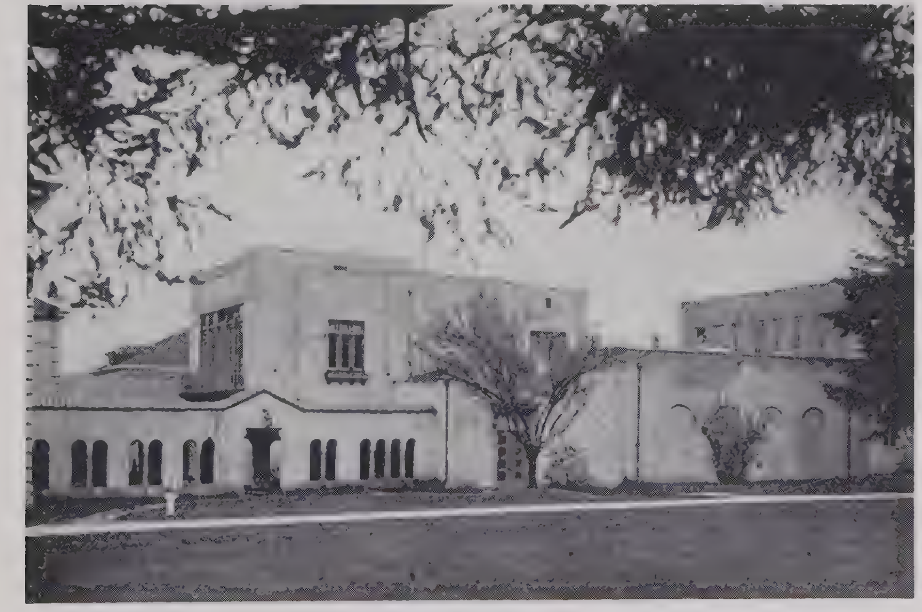
Much that has been said upon art buildings applies to those designed to house architectural schools. The teaching of art history, of drawing and the use of water color, line and wash, as well as the principles of perspective and decoration, tend to overlap those of the art department already described. But the building for an architectural school must be upon a larger scale and for two reasons: first, the display of architectural casts, many of which are full-sized portions of monumental buildings, requires a hall of spacious dimensions; secondly, an institution finding it necessary to erect a building solely devoted to architecture can only be a large one with a heavy enrolment in this department and consequent large classes.

In addition to the hall of casts, a museum is necessary for a great variety of instructive details,—heirlooms from old buildings or objects destined for new ones. The gallery in which exhibitions are held of the current work of practising architects or of drawings produced by the students must have considerable latitude in the extent of its wall space. Removable wings or screens are useful to this end. The drafting-rooms will be of such size and number as the faculty prescribes. The chief requisites of these rooms are good natural and artificial lighting and proper ventilation. They should have at least one large wall space on which cartoons or full-sized drawings can be hung for study and criticism. Files for drawings will consist of stands of large shallow drawers or a device which has yet to be perfected of hanging the drawings from rods hung on racks in cabinets. There should be storage cabinets also for students' drawing-boards. Attic spaces can be utilized to advantage if fitted up with partitions—removable if desired—forming alcoves for students working *en loge.*

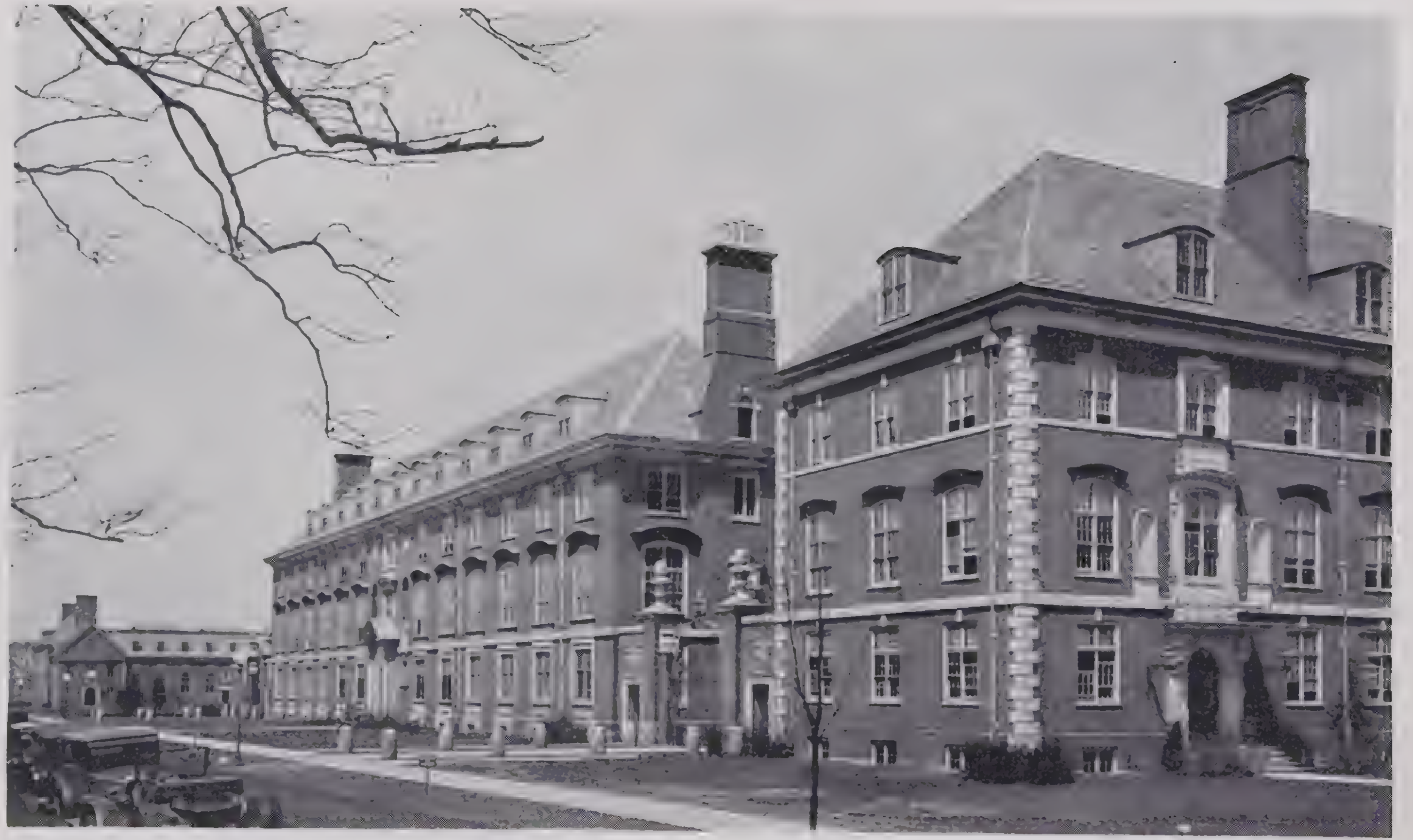
Of utmost importance to the school is the architectural library. Since probably half the contents of this are of the large folio class of works and many long out of print and very valuable, facilities should



THE COLLEGE OF ARCHITECTURE AT THE UNIVERSITY OF MICHIGAN.
DESIGNED BY EMIL LORCH AND ASSOCIATED ARCHITECTS

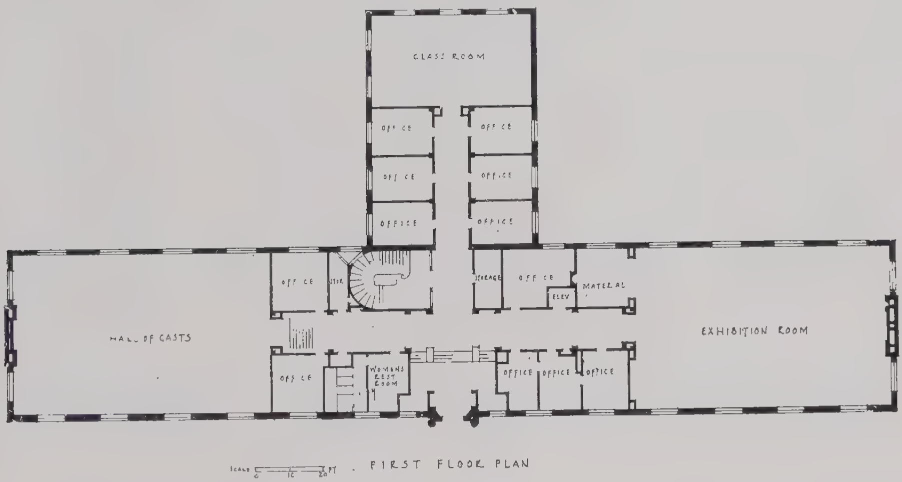


SHOP FOR ARCHITECTURE AND ALLIED ARTS, UNIVERSITY OF OREGON.
LAWRENCE & HOLFORD, ARCHITECTS



DEPARTMENT OF ARCHITECTURE, UNIVERSITY OF ILLINOIS. AT THE RIGHT IS A PORTION OF THE COMMERCE BUILDING.
CHARLES A. PLATT AND JAMES M. WHITE, ARCHITECTS

be provided for permitting easy reference to these, while exposing them to the least wear and tear. Such a library should be arranged for use only under strict supervision. The collections of photographs and of lantern slides play quite as vital a part in the teaching of architecture as in that of any branch of study that could be named; and the best sort of accessible repository for these deserves very careful thought. Remarks already made upon a lecture-hall would apply to one that should be found in a school of architecture, unless the proximity of a hall in a neighboring building of kindred purpose renders the duplication of halls unnecessary.



FIRST-FLOOR PLAN OF UNIVERSITY OF ILLINOIS, DEPARTMENT OF ARCHITECTURE

Rooms should be set aside especially for landscape architecture and for interior decoration and the design of furniture. In classrooms are taught subjects entering into the practice of architecture, such as building law, office organization and procedure, specification writing and the like. There should be a room corresponding to the sample room of an architect's office, in which a collection of building materials, fittings and patented devices are kept displayed. The increasing use of models to present convincingly in three dimensions architectural conceptions otherwise presented in two, calls for a modelling room for work in clay and the setting aside and protecting during intervals of work of those models in the course of construction. This room might naturally be placed in the basement, where also would be a shop, an unpacking-room and a blue-print room.

In designing a building for the study of this, his own cherished life-work, the architect has inspiration to key his skill to the highest pitch that the seven lamps of architecture may cast their light afar. He may utilize with telling effect some fragment or fine detail from a worthy example of architecture recently demolished in the neighborhood. Antique marbles or bronzes from the old world may adorn his structure and especially upon the interior can he resort to the use of architectural casts for niche, panel or frieze. Such things, if carefully selected and placed, will contribute to a distinctive architectural scene, one of those "backgrounds" to college life as we have called it. Here there is an atmosphere withal. The spirit of enthusiastic industry is at a lively key in those periods of day and night work under pressure to complete a *rendu*, when artistic confusion and its happy untidiness add a charm to the scene. Yes, it is an atmosphere that inspires. If any one doubt this, let him witness one of those memorable occasions when, with imagination and the fire of youth, the university architectural society summons all the other arts to its aid, and with a wealth of picturesque form, color, spectacle and music pours forth its ardent enthusiasm in the annual costume ball.

If the museum or gallery is a separate building, the much discussed principles of planning such a building without other encumbrances must be weighed. If the collections are small, pictures and objects of art may be displayed in the same room. Opinions differ upon the comparative merits of three types of plan: namely, that having a large central hall into which wings open from several sides; that which consists of corridors with separate rooms opening upon it; and that which so places the rooms that there is a continuous passage through them. The first is seen in the Walker Art Gallery at Bowdoin. The second in the art gallery at the University of Rochester and at the Mulvane Art Museum at Washburn College. Rooms should be generally proportioned to the objects they are intended to contain, small rooms with low ceilings, for example, for prints and etchings; the largest rooms for large canvases and sculpture. In the former rooms the walls must permit easy hanging of small frames at any point. For this matched boards of soft wood and covered with burlap or canvas has been found satisfactory. For hanging large pictures a grooved steel bar is inserted in the wall extending around the room, either at a height of 10 feet from the floor or at the base of the cornice or both. A wainscot protects the lower walls and improves the appearance of the rooms but curtails freedom of hanging.

CHAPTER XIII

STRUCTURES FOR ATHLETICS

The activities carried on in a complete gymnasium building are more varied than those of any other structure of the college or university group. The gymnasium is for both work and play, for students and faculty, often also for both sexes; and it must be hospitable to the visiting public, whether as individuals or in great numbers. Physical education and athletic competition are the two fundamentals. The space requirements of a few persons at calisthenics or correctives contrast with the facilities needed for competitive games witnessed by thousands of spectators. Furthermore, the gymnasium is at many institutions the largest covered floor space, and as such is hospitable at times to concerts, pageants, student gatherings and dances. At some colleges, indeed, a stage is a conspicuous feature of the gymnasium and avows the room to be an auditorium as well.

That a building should express by its exterior design the purpose of its interior is an architectural maxim that applies especially to a gymnasium and renders it without exact counterpart in the college group. An attempt to make it play an equal rôle in a balancing set of four or six structures having a different purpose is not likely to meet with success. If properly designed, and certainly if a large number of students are to be served, the proportions of the gymnasium will tend to dwarf neighbor buildings and to throw the architectural scene quite out of scale. But we have already pointed out the need of placing the physical activities buildings near the playing fields and apart from the main campus group; and if the gymnasium can be near the residential halls as well, so much the better as tending to encourage frequent use of it.

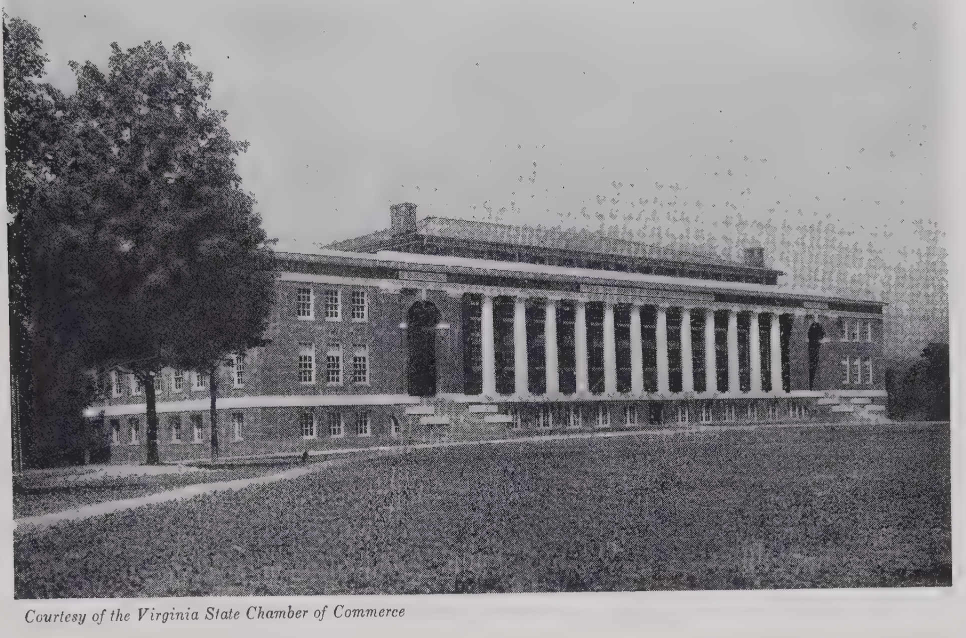
The architectural *parti* for a gymnasium building will in most cases consist of a central mass containing the main gymnasium-room with low wings adjoining it. Perhaps the simplest form has the low wings at each end of the rectangular mass.

There is only one suitable form for the gymnasium floor, and this is a rectangle, the width of which is from 60 to 75 per cent of its length. The standard floor is 60 x 80 feet. For a large university, a floor 80 x 125 is recommended for upper classmen, one 60 x 80 for freshmen and one 60 x 80 for sophomores. For a small college a gymnasium 80 x 120 feet may be divided by removable partitions into two floors each 60 x 80. For exercising, 45 square feet of floor space, or better 50, should be considered necessary for a person.

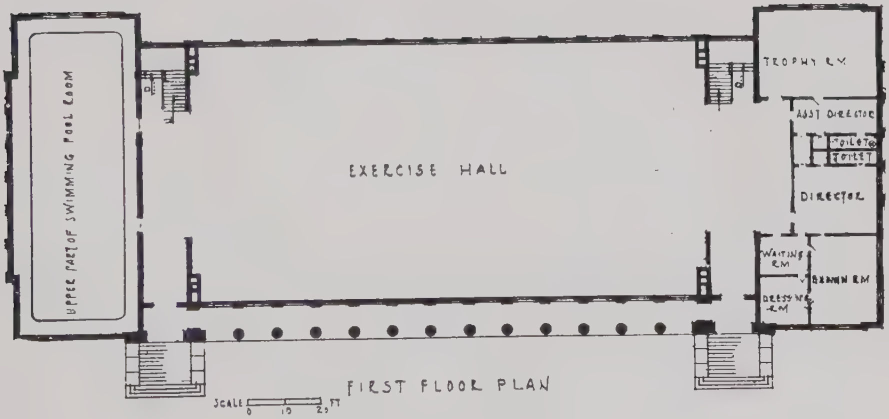
SIZES OF MAIN GYMNASIUM FLOORS

Men's:	DIMENSIONS
Bowdoin College	112′ x 76′
University of Chicago, Bartlett Gymnasium	195′ x 75′
University of Colorado	116′ 8″ x 80′
Dartmouth College	200′ x 80′
University of Illinois, South Men's Gymnasium	189′ x 122′
Illinois Wesleyan University	100′ x 72′
Lehigh University	90′ x 70′
University of Michigan, Waterman Gymnasium	246′ x 90′
Northwestern University, Patton Gymnasium	103′ x 70′
Oberlin College, Warner Gymnasium	100′ x 65′
University of Pennsylvania	250′ x 75′
Pomona College	105′ x 75′
Princeton University	166′ x 101′
Rensselaer Polytechnic Institute	125′ x 60′
University of Southern California	76′ x 53′
Syracuse University	210′ x 100′
Washington and Lee University	130′ x 67′
Women's:	
Bryn Mawr College	90′ x 50′
University of Chicago, Ida Noyes Hall	100′ x 70′
University of Colorado	95′ x 62′
University of Michigan, Barbour Gymnasium	90′ x 85′
H. Sophie Newcomb Memorial College	90′ x 50′
Oberlin College	95′ x 50′
Rosary College	70′ x 54′
Smith College	100′ x 75′

This large floor space presupposes a lofty void which should be expressed on the exterior by windows of a size architecturally appropriate as well as effective in making the room attractive and airy by means of natural light and ventilation. The sills should be 8 feet above the floor. If the gymnasium-room is surrounded by a corridor along the exterior side of which subsidiary rooms are placed, the gymnasium-room will necessarily have its side windows very high in order to bring them above the roof of these rooms. The windows should be supplemented by skylights in the roof, or better yet a monitor, with sash at the sides. The roof trusses will, of course, be set across the narrower span, which means that the roof ridge will correspond with the longer



Courtesy of the Virginia State Chamber of Commerce



DOREMUS MEMORIAL GYMNASIUM, WASHINGTON & LEE UNIVERSITY.
FLOURNOY & FLOURNOY, ARCHITECTS

axis. This results in gables at the ends where there may be additional windows.

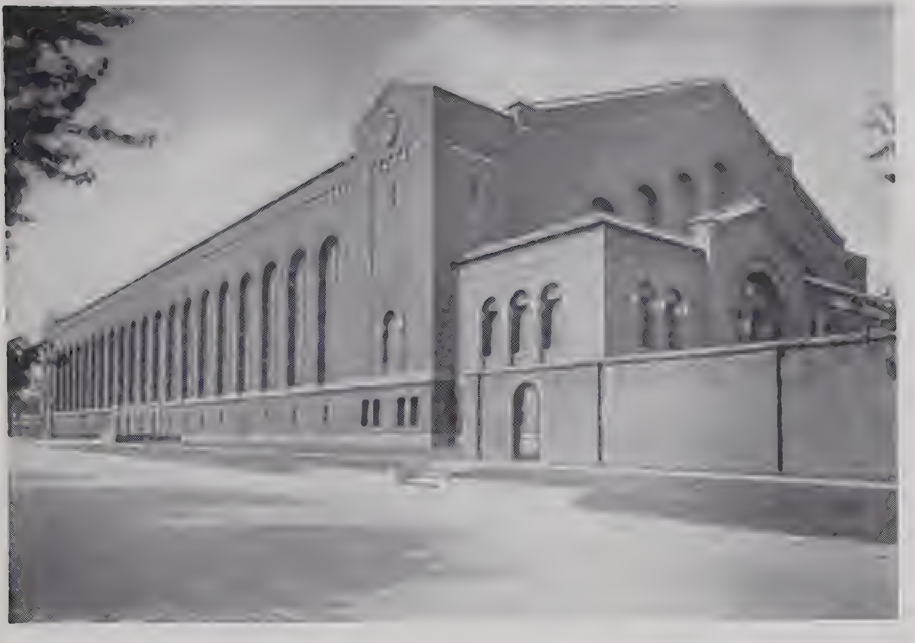
The clear height of the gymnasium-room as determined by the lower chords of the roof trusses should be not less than 18 nor more than 22 feet, if it is to serve the ordinary programme of all-round physical training, with its suspended and swinging apparatus, rather than to have its height determined by the predominance of basket-ball. (See page 234.)

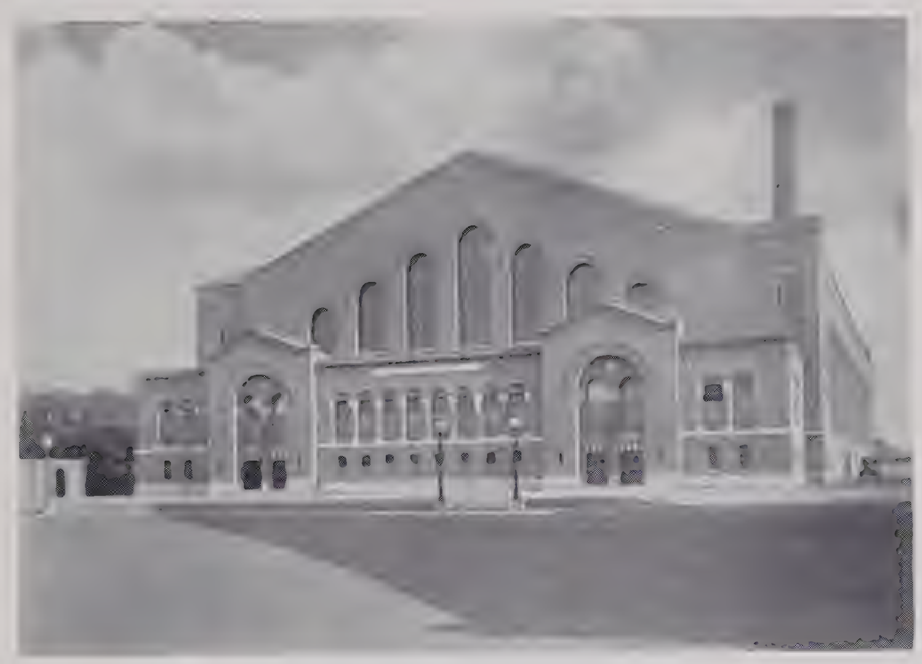
A running-track is recommended only for gymnasiums 50 feet or more in width; and it should be elliptical or, preferably, semi-circular at the ends. It should be at least 5 feet wide and should be bracketed from the wall or hung from the roof trusses by rods that are clear of the handrail. It should be properly "banked" with a curvature depending on the radius of the track at the ends or corners and the speed of the runner. Gymnasium equipment experts deplore windows of a height that will make them pass the track, but the design of the exterior of the building requires that they do so to avoid small, ill-proportioned windows under the track and separate windows above it.

A modern gymnasium-room will have walls of light-colored vitreous brick with all corners rounded, a floor of maple, ample provision for attaching both wall and suspended apparatus, drinking fountains and cuspidors recessed in the walls, doors opening outward, and an entire absence of any structural projections upon the periphery of the room. There should be a spectators' gallery and also a balcony for casual visitors.

An auxiliary or faculty gymnasium should be about 40 x 60 feet, and there should be a room at least 15 x 20 feet in size for special exercises. These rooms should communicate with the main gymnasium by doors 6 feet wide, and there should be a room about 12 x 15 feet, also opening by six-foot doors from the main gymnasium, for the storage of apparatus. An instructor's office should command a view of the exercising floor space through large low windows protected by wire screens.

Headquarters of the physical education department should be near the main entrance of the building, and for these there should be an office for the director, a weighing and measuring room, a waiting-room, and a small room for a clerk and his records. Upon an upper floor is a suitable location for a clubroom. Here, or in corridors or lobbies, trophies may be displayed. At a point near the main entrance the lines of travel for users of the building and for spectators separate, and the plan should facilitate the course of each to their allotted places. Men in gymnasium suits are not to be exposed to drafty corri-

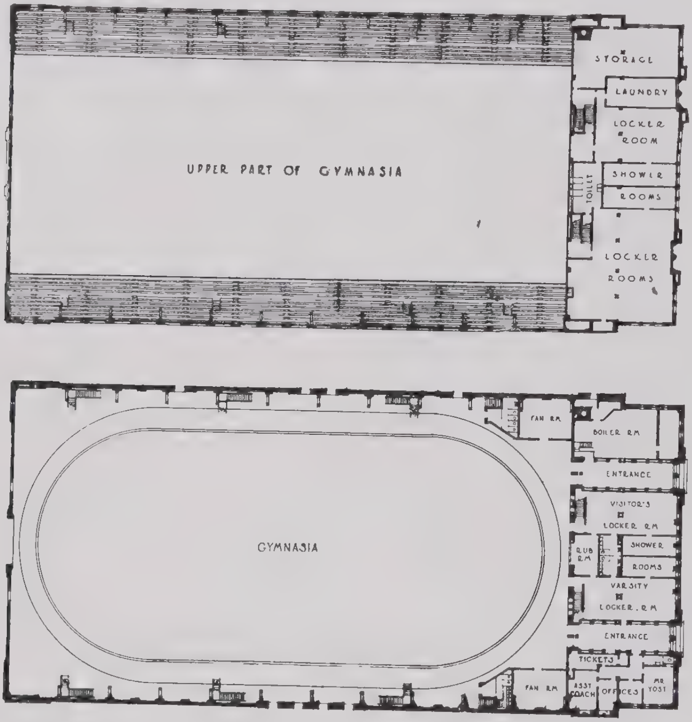




YOST FIELD HOUSE, UNIVERSITY OF MICHIGAN.
SMITH, HINCHMAN & GRYLLS, ARCHITECTS

dors and the entrance of spectators is not to interfere with the work that goes on in the building.

For a large university there should be six to ten handball and squash courts. Doctor Geo. L. Meylan of Columbia writes[1] that a new gymnasium building for a college or school should have at least



PLANS OF YOST FIELD HOUSE, UNIVERSITY OF MICHIGAN

one standard handball court for each one hundred students and faculty; and "a good size for a one or two wall court is 18 x 18 feet for the playing space on the wall and 18 x 30 feet on the floor. There should be at least 10 feet of clear space behind the back line on the floor."

There should be a boxing and a wrestling room and a room for fencing; or, if a small institution, one room for all of these. It should be at least 20 x 20 feet to accommodate the standard wrestling mat of 16 x 16 feet. It should be well lighted (especially for fencing) by windows having sills at least 5 feet from the floor. The walls should be wainscoted with wood.

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[1] "Physical Education Buildings for Educational Institutions, Part I, Gymnasium and Lockers," prepared by the Committee on Construction and Material Equipment and the Director of the Building Bureau of the Society of Directors of Physical Education in Colleges.

The locker-rooms should not be far removed from the gymnasium floors. As it is rarely possible to extend the building laterally so as to place them at the same level, they are usually put in the story below, where they are reached from the gymnasium by one or more stairways constructed for this purpose only and enclosed in small hallways of their own. The floor space required to provide the necessary locker accommodation under whatever system can be obtained from the catalogues of locker manufacturers, but if the "Kansas City" plan is used a separate check-room must be partitioned off from the remaining locker space.

Adjoining the locker-room should be the shower-room and its companion drying-room. These should be rectangular rather than square. Between them should be the toilet-room; or at least it should be on the dry side of the shower-room. As the shower-room should also adjoin the natatorium, it may serve as a passage between the two. "Gang showers" in one open room will answer for men, but there should not be more than 10 shower-heads in one enclosure. "As a rule, a separate bathroom must be provided for each group of individuals for which a separate locker-room is needed."[1]

The natatorium should be bright, airy and attractive, preferably with a southern exposure. It is suggested by some to put it when possible in a low projecting wing of the building, where a portion of the room at least can have direct light from above through a skylight, but sunlight falling directly into the pool is not considered desirable by some authorities on account of its deleterious effect upon the water. The standard pool is 60 feet long by 20 to 30 feet wide, but many pools larger than this have been recently built. A length of 75 feet is excellent, and if the width is 35 feet, it allows for six racing lanes with 2½ feet in addition on each side. There should be 15 feet clear length of floor beyond the deep end of the pool, that is, where the springboard is located. Ten feet clearance at the opposite end and along the side opposite the bleachers is ideal, but the confines of the building may necessitate a passage as narrow as 3 or 4 feet along the pool opposite the bleachers. At some institutions there is an additional smaller pool for the instruction of beginners.

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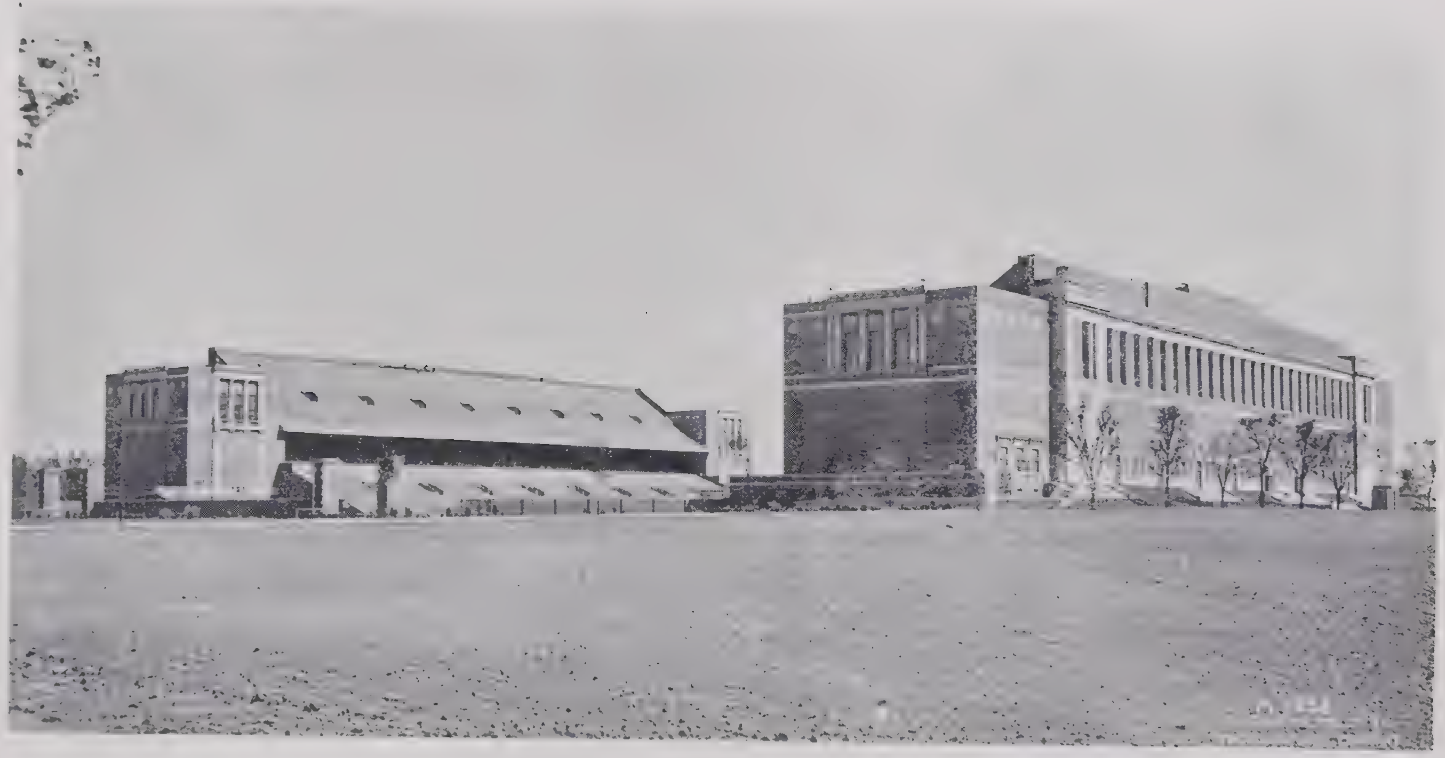
[1] "Gymnasium Construction," published by Narragansett Machine Co., Providence, R. I.



THE STADIUM, UNIVERSITY OF ILLINOIS. HOLABIRD & ROCHE, ARCHITECTS

SIZES OF POOLS

	FEET
Bryn Mawr	68 x 20
Carleton	60 x 25
Chicago, Bartlett Gymnasium	60 x 28
Chicago, Ida Noyes Hall	60 x 24
Colorado	75 x 30
Dartmouth	75 x 30
Illinois	75 x 32
Lehigh	75 x 25
H. Sophie Newcomb	60 x 20
Minnesota, two pools, each	60 x 30
Pennsylvania	75 x 35
Pomona	75 x 36
Princeton	100 x 25
Rensselaer Polytechnic	75 x 30
Smith	76 x 22
Vassar	43 x 24
Washington and Lee	70 x 25
Yale	75 x 30

Spectators should be accommodated in an area at the side of the pool, not at the end. They should be restricted to this area and admitted to it by a separate entrance, for it is a principle of natatoria that no one should enter the pool or walk along its borders who may have mud from outdoors or dust from indoor floors upon his feet. So scrupulously is the cleanliness of the water guarded, for example, at the new gymnasium at Annapolis that the middies can only reach the pool by walking through a short corridor the entire floor of which is covered with 6 to 8 inches of water. Seats for spectators may be of the bleacher type, and under the concrete steps to which the seats are attached the pumping and filtering apparatus may possibly be installed.

Near the natatorium may be suitably placed the suit-service room and its accompanying laundry and drying room. In the basement, or at least in the story below the main gymnasium floor, should be placed dressing-rooms and shower-rooms for home and visiting teams. These are but periodically used; the more valuable space on the main floor should be devoted to daily uses.

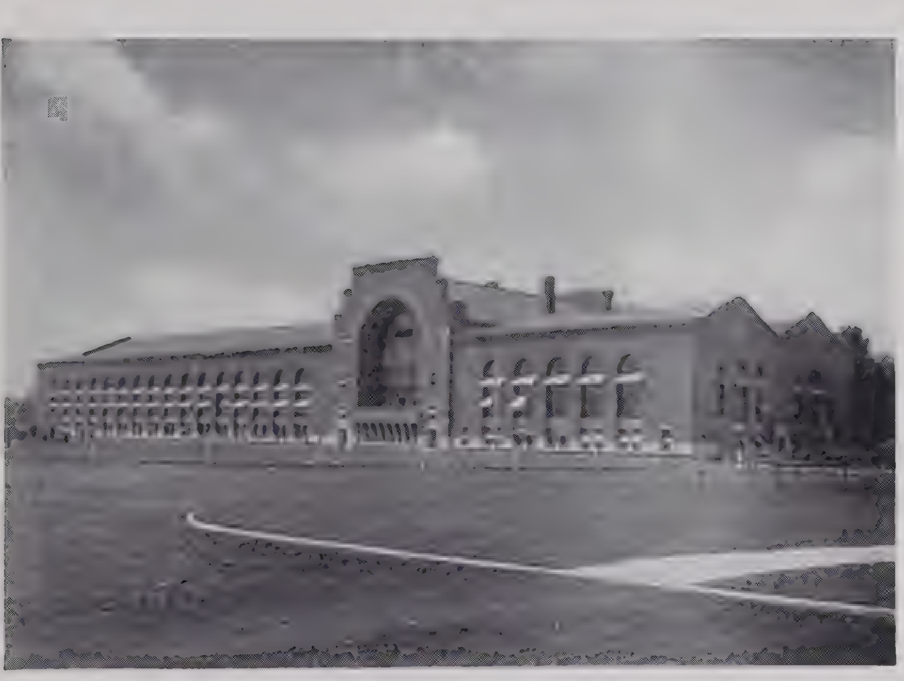
If necessary for the same building to answer for both sexes, the main exercising floor may be used by them in turn, and it will be convenient if the girls' locker-rooms and bathrooms are planned so as to be reached from the opposite end of the gymnasium floor from that used by the boys. For girls, two, three or four dressing-booths should adjoin each shower-bath cubicle; or the dressing-booths may be entirely separated from the showers if the girls or women are given a sheet or towel to drape around themselves while going to and from the showers and dressing cubicles, located in this case in an adjoining room. The sheet is hung as a protection to the entrance of the shower while bathing. This scheme contributes to class bathing, when the water of the showers is centrally controlled.

Fortunately there are few coeducational institutions that do not have separate gymnasia for the two sexes; but it is otherwise with a pool. The building and maintenance of one of these is so expensive that it must oftener be shared. The rooms adjoining it can be arranged as suggested above for a gymnasium so that at certain hours the doors from the boys' side of the pool can be closed and those opened which lead from the girls' rooms, and later this operation reversed.

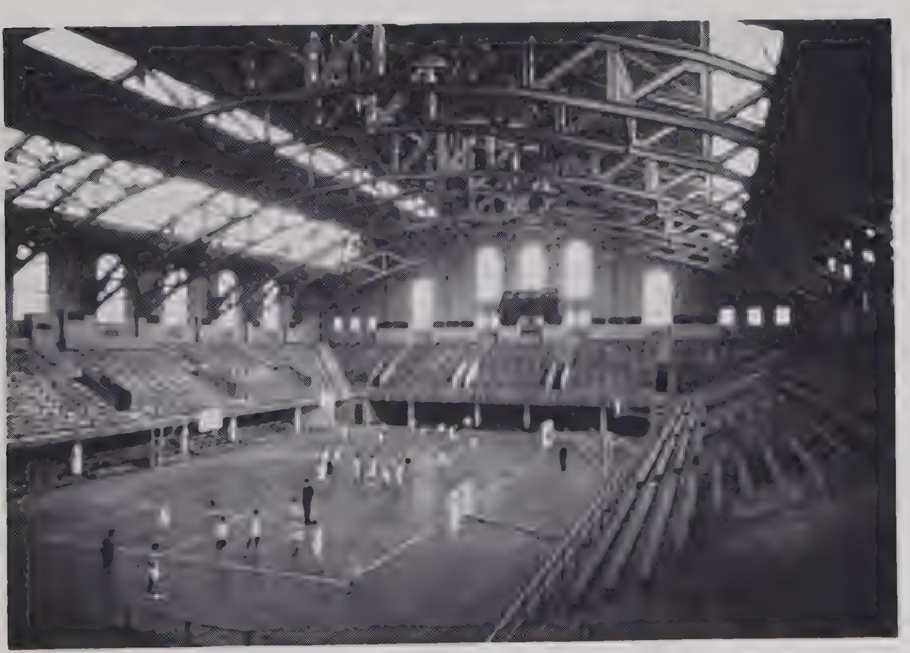
For women's colleges the number of rooms given in the complete gymnasium building we have attempted to outline can be considerably reduced and the plan simplified in the manner the physical education staff will specify; but the general principles of planning indicated will apply. At girls' colleges the gymnasium is almost always used for dances and entertainments. Therefore, coat-rooms and retiring-rooms for both sexes should not be forgotten in preparing the plan.

Extensive curricula under the head of physical education demand additional facilities and especially does the public interest in certain athletic events. Gymnastic exhibitions, boxing, wrestling and swimming contests can be prepared for and witnessed in the type of building above described; but football, basket-ball, baseball, track and rowing remain to command a degree of public interest that appears to outrun all accommodations possible to provide. Football and basket-ball generally lead all other sports in making the athletic department not only self-sustaining, but sometimes produce an income that has been devoted to erecting dormitories and other buildings.

These conditions have resulted in the recent development of two new types of athletic buildings: the indoor stadium and the field house, while the outdoor stadium enclosing a playing field occupies a place by itself in accommodating the largest crowds that will gather in homage to athletic prestige. The first of these structures provides, as its name implies, a covered space for such spectacular games as can be played and witnessed by great numbers within the confines of a practicable structure. The natatorium at Yale, with its marginal floor for contestants and high above this seats for several thousand spectators, might be logically considered a building of this class. But the game chiefly played in these buildings is basket-ball, and the size of the playing floor is usually based upon the requirements of this game.



INTRAMURAL SPORTS BUILDING, FERRY FIELD, UNIVERSITY OF MICHIGAN.
SMITH, HINCHMAN & GRYLLS, ARCHITECTS



INTERIOR OF THE PALESTRA, UNIVERSITY OF PENNSYLVANIA

MEMORIAL GYMNASIUM, UNIVERSITY OF VIRGINIA.
DESIGNED BY THE ARCHITECTURAL COMMISSION

The floor should be 150 x 100 feet to give safe run-over space beyond the maximum size of playing court, which is 90 x 50 feet.[1] The clear height to the lower chords of the roof trusses should be at least 30 feet and better if 40 feet. The light should be high up, and if from a skylight, this should face north. Artificial lights should also be high not for lighting alone but to avoid obstruction to high throws. Indoor baseball is best cared for in the larger field house, but if it must be played in the covered stadium the space must be larger, the wood floor used for basket-ball must be made removable, and the diamond, 27 feet on each side (maximum 35 feet) laid out on the earth floor.

The next problem is to accommodate the spectators, that they may be quickly led to their seats past control gates and through wide, safe and well-lighted corridors, and that all persons should have ample means of egress in case of panic. At Illinois the capacity for a basketball game is 7,000; at the University of Pennsylvania a little less than 10,000 are seated in the new "Palestra" and there are probably other examples of the last named capacity. Proximity to large centres of population affects attendance and the necessary seating.[2]

[1] The minimum size of playing court is 35 x 60 feet.

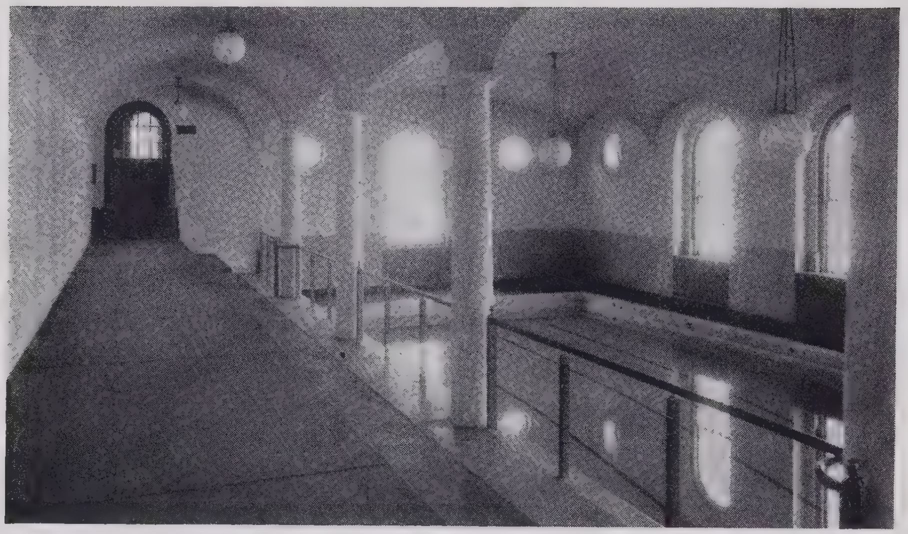
[2] The University of Pennsylvania Palestra is only 1½ miles from the Philadelphia City Hall.

All seats can be of the bleacher type,—planks secured by iron standards or brackets to the concrete steps. Inasmuch as the interest in all games is not equal, it is well to have a latitude in the extent of seating. This is accomplished by means of a lower zone of removable seats. At Illinois these are of wood and are taken down and passed through trapdoors to storage-rooms below. At the University of Pennsylvania the seat planks are secured to a steel framework which rolls on tracks sunk in the floor to a position under the higher zone of permanent seats. Rooms for visiting and home teams must be provided, also a club-room or lounge, a trophy-room and public retiring-rooms. Booths for the sale of pennants, programmes, photographs and for fountain service and light refreshments may be contrived in the lobby or corridors, if their presence is not inconsistent with the rules of the institution.

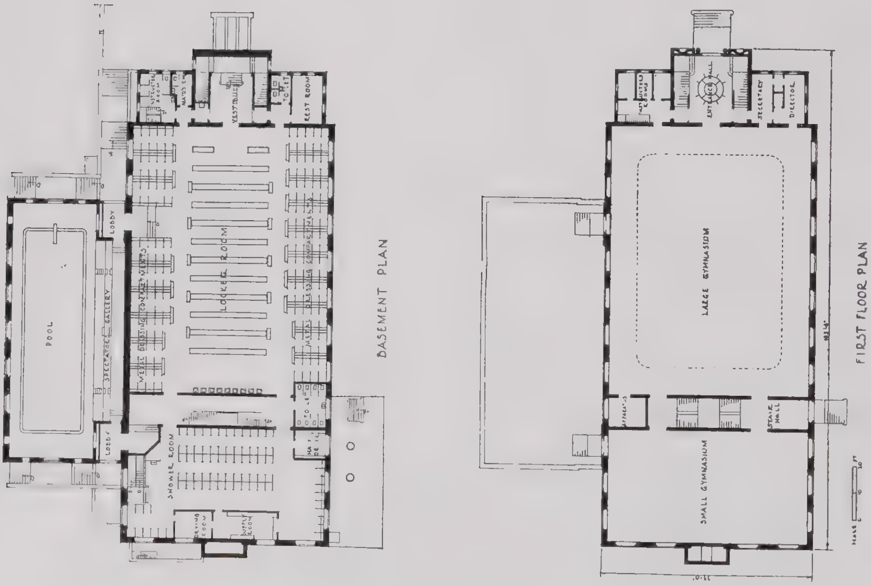
Buildings of moderate size seated beside tennis courts or golf links and providing dressing-rooms and lounges have been known in the past as field houses. This name, however, is now being appropriated by the buildings of impressive proportions accommodating track, indoor baseball and football practice, as well as basket-ball, of which several games may be played simultaneously. In fact, the arena of the Yost Field House at Michigan measures 160 x 300 feet, which is the size between goals of a regular outdoor football field. This building was completed a few years ago and is at the present writing perhaps the most complete of its class. It has a removable wooden floor and seats for 12,500 spectators. Important features are an eight-lap-to-the-mile track and a 75-yard straightaway. The building provides for football practice to be carried on in bad weather and its 65 feet of clear height enables baseball practice to get under way earlier in the spring than would otherwise be possible. Four floors at one end of the building are occupied by trophy-rooms, storerooms, drier-rooms, locker and shower-rooms for 4,200 students.

Larger yet than this is the field house under construction at the University of Minnesota. Measuring 236 x 446 feet, with fourteen 70-ton hinged trusses rising 104 feet above the ground and seating in its balcony alone 17,000 persons and 41,000 if the ground floor is used, it bids fair to substantiate the claim of being on its completion the largest structure devoted to athletics in the United States. Veritably will it be a “field” within a “house.”

The only structures that can vie with this in size are the armories which are to be found at some institutions, such as, for example, Cornell, Illinois and Iowa State College. At Illinois indoor meets are held in the new Armory, which is connected by a tunnel with the new gymnasium.



NATATORIUM OF THE GYMNASIUM, SMITH COLLEGE.
JOHN W. AMES AND EDWIN S. DODGE, ARCHITECTS



PLANS OF THE GYMNASIUM, SMITH COLLEGE

If the wooden grand stand of the past boasted its superiority over its more democratic neighbors, the bleachers, its glory has been extinguished by the modern stand of reinforced concrete. Greater numbers of spectators are now seated and with greater comfort and safety by the use of a material that was fortunately ready at hand to replace the aged and deteriorating wood. The simplest of these concrete stands are open below the seats and are found flanking open playing fields, the varying lengths of the stands probably revealing a rather close relationship to the funds available for their erection. They are, of course, most economically built if open below; but this is unwise economy, for the stand alone is equivalent to a roof and two walls, and it is used only occasionally. Why not build the remaining walls and have a building that will assure an income in terms of daily use for the capital invested? The sloping range of steps to which the seats are secured permits the placing of the interior floors of such a building on two levels. Here spectators can seek shelter if a sudden storm overtakes an athletic event and other conveniences can be provided them. A good example of a stand and training house of this type is found at Carleton College. It has every foot of interior space effectively put to use and contains upon the lower level a 100-yard straightaway, locker-rooms, supply-rooms, gang-shower room, dressing and shower-rooms for home and visiting teams, medical room, supply and store rooms and public toilets; and upon the upper level, five squash courts, a wrestling-room, a storage-room, public retiring-rooms, and a five-room living apartment for the janitor.

At large centres where attendance is heavy for baseball, football and track events, stands that seat twenty or thirty thousand spectators have long since been outgrown. A stadium wholly or partially enclosing the field has taken their place, for the number of persons wishing to witness major events appear limitless, and the auto now supplements steam and trolley lines in aiding their foregathering.

The designing of one of these huge structures is to a large extent an engineering problem; but the architect's skill is also necessary to insure, in co-operation with the engineer, the most graceful proportions possible and well designed detail and ornament. The great size spells prominence in the scene and therefore calls for the utmost study in making the stadium a thing beautiful and inspiring to behold. The exterior may be freed somewhat from the engineering exigencies of the seating within; and if liberty is taken with the mathematical spacing of structural supports, the arcaded periphery may be agreeably proportioned. Gateways may be conceived of impressive size, sculpture and inscribed tablet may ennoble the manly sports to which the structure is dedicated, and surmounting all on gala days may flag and pennant be held to flutter in the breeze to the tingling blood of a glowing multitude.

In planning a stadium the main essentials are a well drained and surfaced and properly orientated field, a quarter-mile track, a 220-yard straightaway, a processional entrance, the maximum comfort for each spectator within the minimum area of stand, visibility as nearly perfect as possible for all, ramps and passages insuring easy congregating and rapid dispersal of spectators, sufficient comfort-stations and retiring-rooms for them and the best arrangement of rooms for training and practice.

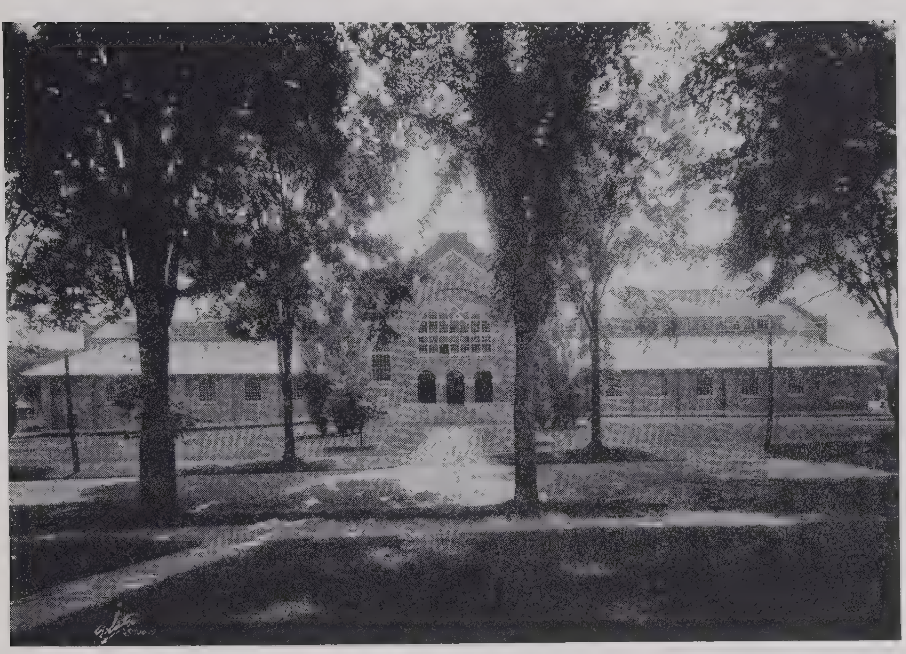
The ideal to strive for in orientation is to consider the course of the sun's rays during the afternoons between September 25 and November 25 and to fix the transverse axis of the field so that they will, during these periods, fall as nearly as possible parallel to this axis.

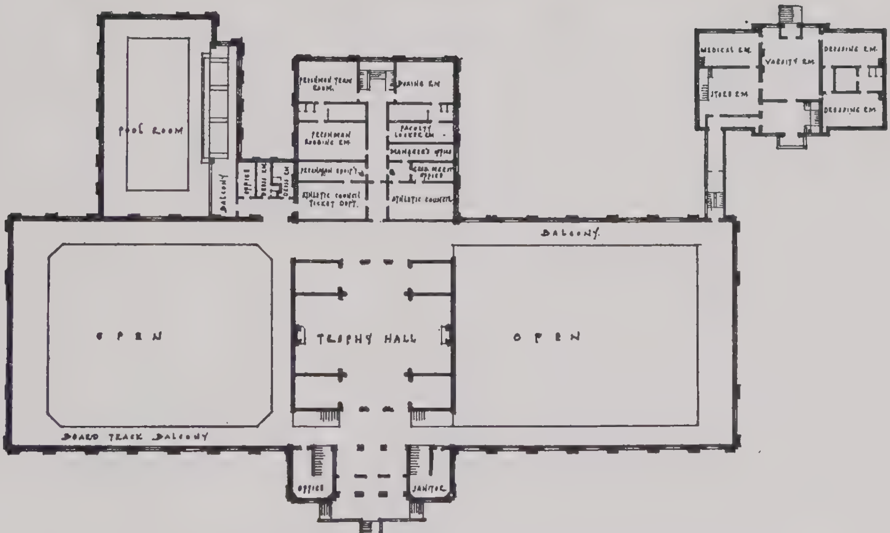
If the length of the field will not easily accommodate the track for the 100 and 220 yard straightaway, use can be made of one of the main portals to the field and also a gap in the stands can be made. This gap should not be covered over, however, for runners should not be expected to dash into a tunnel.

The slope of the range of steps supporting the seating and the development of these steps in a horizontal plane to surround the field is for any stadium an intricate geometrical problem in which visibility of the maximum number of spectators is ever in the mind of the designer. To obtain good results this slope should be slightly dished by making the risers of the seat steps very low at the base of the seat slope and progressively increasing them as they approach the summit. It would seem that to make the stands concave in plan as are the four surrounding the field at Northwestern, would give the utmost visibility with respect to numbers of spectators. Another advantage of this is to place the greatest number of seats between lines that are the imaginary projections of the two football goal lines. This is emphasized in the Stadium at Northwestern and in the Cornell Crescent.

The seats should be of cypress or redwood planks 10 or 11 inches wide and so secured to the reinforced concrete by means of cast-iron frames (4 feet on centres) that the plank will be a few inches above the concrete tread behind it. This is to give toe space to persons behind and to facilitate sweeping. The seats should not be less than 25 inches back to back and preferably 26 inches. If the former dimension is used, it would mean that each spectator occupies a space 18 x 25 inches.

Portals reaching the seats should not be less than 5 feet 6 inches wide and should emerge at a level near the middle of the seat slope.





FIRST FLOOR PLAN

THE GYMNASIUM AT DARTMOUTH. CHARLES A. RICH, ARCHITECT

One such entry may serve as many as 1,500 seats. If the slope is unusually high, there should be two entries at different levels. These entries lead to and from the main corridors which should be at least 18 feet wide and communicating with the ground in the form of ramps at an incline not exceeding 15 per cent. Stairways should be avoided, if possible. Zig-zag ramps or ramps returning upon themselves in a tower rectangular in plan are preferable. In order to leave the stadium it should not be necessary for spectators to go upon the field.

The presence of balconies suggests the provision for seating having been made at different times and the desire to have the demand for seats demonstrated before providing them and to thus avoid the risk of over-building. A double-deck stand may also be necessitated by the limited size of the site. Protection from sun and rain is a practical advantage of balconies. At Syracuse a large central section of the stand is roofed in the manner of a pavilion.

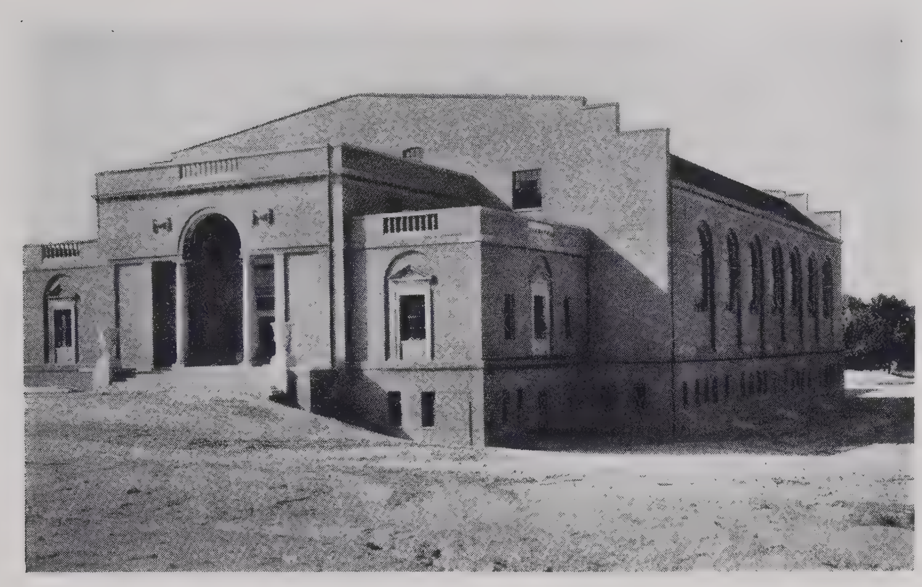
There should be provision for extending the capacity on occasion by means of temporary seats. These can be secured to demountable steel frames and all taken down and stored in rooms under the stands reached by wide doorways from the field.

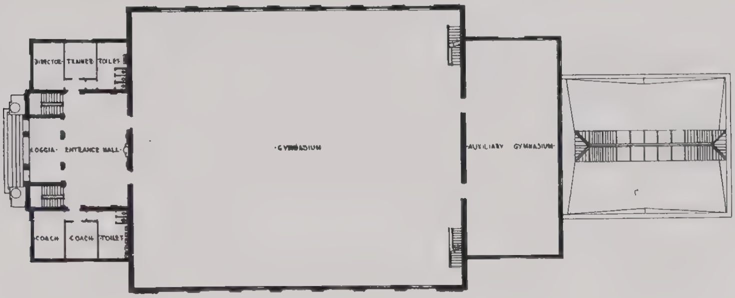
The players' benches and coaches' boxes should be recessed, if possible, under the front of the stand with a view to avoiding any interruption to the vision of spectators.

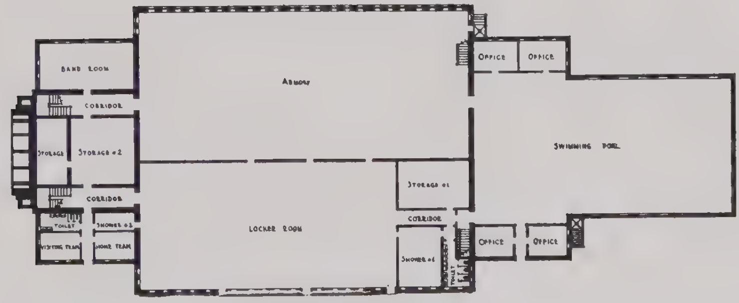
A vitally important feature of the stadium without which the activities occurring in it could be but slowly and ill conveyed to the outside world is the press stand. This should be placed at the top of the slope of seats and opposite the centre of the field in order to obtain the best possible view of the playing. It should be enclosed, steam-heated and should have desks with telegraphic connections for at least 100 reporters. (Northwestern has 250.) There should also be a broadcasting-station.

In the space enclosed under the seat slopes there should be several large team-rooms, each consisting of a locker-room with showers and toilet facilities, and a room with rubbing tables. There should be a doctor's office, a director's office, two or three exhibition squash courts with spectators' galleries and five or six smaller courts for individual squash or handball, a rifle range, dirt floor areas for indoor practice in jumping, pole vaulting, a space for baseball batteries, ticket offices and a number of rooms for storage and equipment. It will also be feasible to include in the plan rooms for gymnastic classes and lectures; and when this is done the stadium will be in effect a huge auxiliary gymnasium.

A training house offers the most suitable living quarters in which







GYMNASIUM OF NORTH CAROLINA STATE COLLEGE. HOBART UPJOHN, ARCHITECT students training for athletics may be segregated. Their trainers also are usually in residence here. It is appropriate that the building should have a domestic character, architecturally and otherwise, for it is to be a pleasant home complete in itself. Cheerful living-rooms and dining-rooms and a kitchen are the necessary accompaniment to sleeping quarters planned to insure the most wholesome living conditions. A number of beds can be placed in one large and well-ventilated sleeping-room. There come to mind in illustration of this type of structure Varsity Hall at Pennsylvania State College and the Davis Varsity Field House at Dartmouth.

It is regrettable that rowing cannot take place within confines permitting the sale of spectators' seats in sufficient number to make this sport more than financially self-sustaining instead of being an expense, which it is to most athletic departments. But such is the character of this sport that the sloping banks of water courses are provided spectators by Nature and other facilities are unnecessary. There remain then under the head of this splendid sport the boat houses which are the headquarters of the crews and their craft. Fortunate are those institutions which border upon water courses suitable for rowing, and opportunities to erect these picturesque structures have been seized upon in not a few cases. The principal elements of these buildings are a spacious first floor with racks for the requisite number of shells, ample gangways leading to the float through 9-foot openings with sliding doors, a work-shop for repairing; and upon the second floor an office, a director's room, two locker-rooms each with its own showers, a club and trophy-room and a kitchen. It may also contain living-quarters for crews in training and for coaches.

CHAPTER XIV

BUILDINGS FOR STUDENT AND FACULTY WELFARE

Societies and associations for student fellowship and activities are quartered according to their size and financial means. We are now speaking of clubs that are neither fraternities nor student unions. Examples of how they may come into flower architecturally are found notably in the clubs at Princeton, at Harvard, Yale and other large universities, especially those privately endowed. The Shakespeare Club at Wellesley is a notable example at a women's college.

The Christian Associations are probably common to the greatest number of institutions. Of vital importance is their work and it is rapidly expanding beyond the scope formerly embraced by the conventional "Y." The most modest centre of activity of this kind consists so largely in initiating and managing movements that no room of its own would suffice for meetings that must be held in chapel or auditorium. The association's own quarters then are found to be a suite of two or three rooms presided over by a secretary and an assistant or two. If enrolment is large and membership in the college or university "Y" proportionately numerous, the association should have a home of its own. Except at some denominational colleges, the Y. M. C. A. and Y. W. C. A. buildings have been usually built upon sites adjacent to the campus, sites which they have acquired outright or hold under long-term lease, thus insuring complete control of their own estates and fortunes.

When buildings have been specially planned, they are essentially club-houses. A lounge, a library, game-rooms, offices for the director and perhaps a limited number of rooms for guests are the chief features. For the Y. W. C. A. a music-room may be substituted for a billiard-room. A soda fountain is usually demanded and at some locations a cafeteria service, if not a dining-room, is included. Of attractive Christian Association buildings recently built may be mentioned those at the Universities of Minnesota, Washington and Pennsylvania.

As an organization for student welfare and social life at college or university, the Student Union occupies a unique place. The scope of its work is diverse, and similarly is the manner in which small unions or those organizations which are incipient unions are provided with headquarters. At a small college perhaps the athletic board and the musical and dramatic clubs find the only nook they can call their own within the domain of the Union, and this in an improvised building or portion thereof.

If such a union is to have a building of its own, it is presumed that a small and simple structure will suffice. It should contain a comfortable and cheerful lounge, an office for the person in charge, rooms for meetings of student organizations, and if possible, offices for the major student societies needing permanent headquarters. It may also contain the post-office and the college bookstore, as does Chase Hall, with its homelike atmosphere, at Bates College.

Expansion will depend on the size of the institution; its location,—whether in a small or large town near or far from commercial sections,—and the funds available for the building. The predominant character of the building should be homelike, for it is indeed a home for the student, and yet more. It is his club, and yet more; for it combines the comforts and conveniences of a club with those of a hotel. And yet it is more than a hotel, for all these comforts are merged in the pervasive atmosphere of the college of the student's choice, and he has as a member of the Union a direct personal interest in its activities. The Union building is the daily haunt where he and his friends meet, talk, eat, work and play. It has been said that "the Union is the recognition of the importance of the leisure hour."

It has also been said that in large cities from which most of the students come there will be no need of a large building. But the fact that all union buildings erected earlier than fifteen years ago are now found of inadequate size would indicate that even in large centres student homes are not sufficiently numerous to rob the Union of its usefulness, or that "the Union idea" has so expanded as to render the Union and its house largely independent of local surroundings. It may not attempt to serve food on account of commercial competition near by, or it may not have bedrooms to compete with neighboring hotels; but there are many other facilities left for the Union to provide.

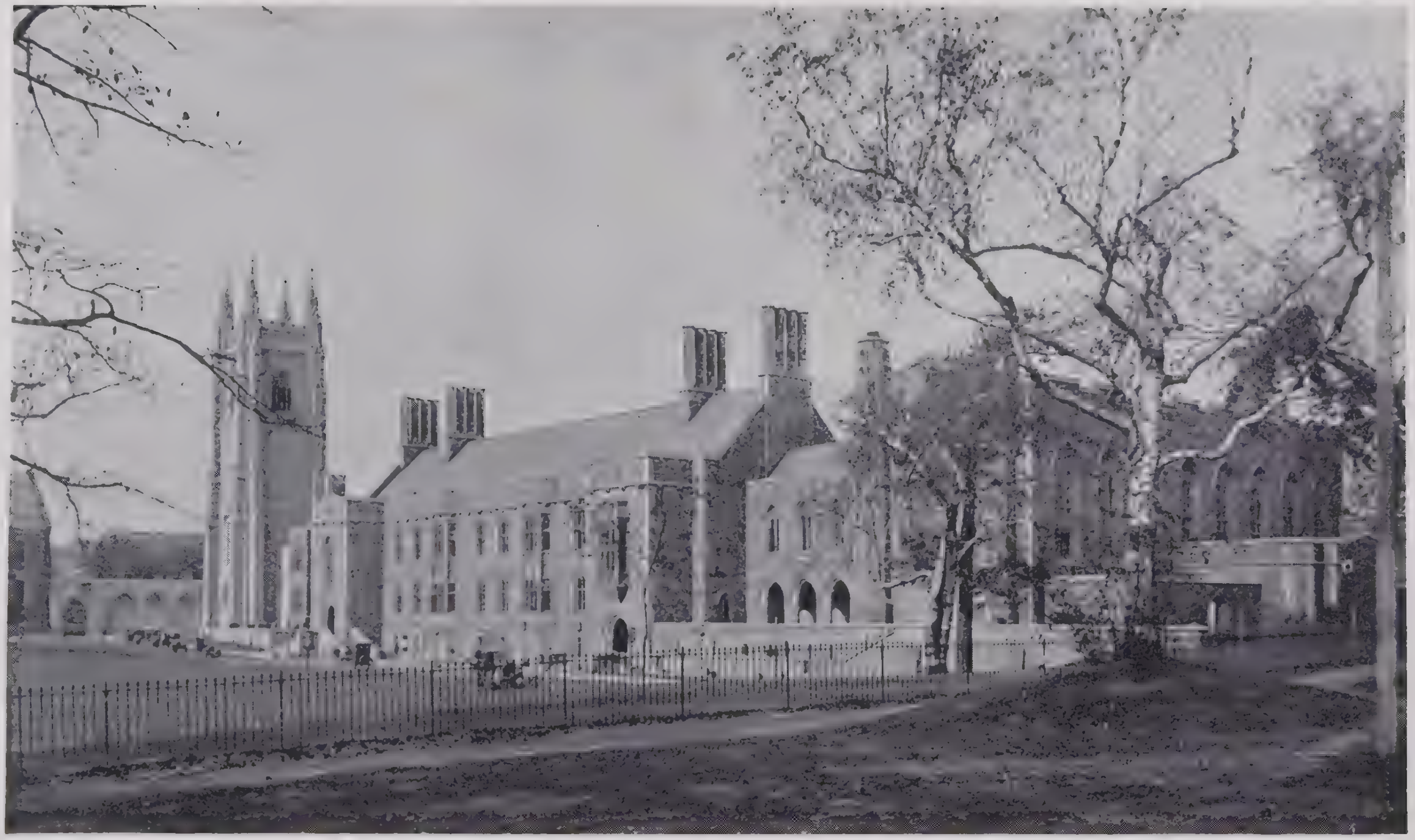
A large university in a small town is the ideal condition for a union building of the most comprehensive type, the main features of which we will now attempt to outline. The membership is assumed to be of men.

A large and efficient coat and check room, an information desk and administrative offices should be provided near the entrance. The great lounge will be a large beautiful room with huge fireplaces, bays and alcoves. Hardly less in size and certainly no less carefully designed will be the library. This should be upon the second floor as should also be the music-room (large enough for recitals). There should be a room for writing and study. It is essential that none of these four rooms should be in any sense a thoroughfare. There should be a small dance or convocation hall for proms, concerts and banquets, and in addition a billiard-room with thirty tables at least. Complete food service will be provided in a large general dining-room, a small or private dining-room which can be rented, a faculty dining-room, if there is no faculty club-house with food service on the campus, a ladies' dining-room, a men's tap-room with all-day short-order or cafeteria service. There should be a ballroom for about 300 couples, an auditorium with projection booth for 1,250 or more persons, offices for all undergraduate activities and rooms for the various societies, publication offices of the campus journals, general-committee rooms, card-room, barber-shop, bowling-alleys, bookstore, post-office, hotel-rooms for accredited guests and a dormitory for visiting teams. Circumstances may warrant a swimming pool or a theatre or both. There should be spacious storage-rooms for furniture when not in use.

If in a large town, some of these facilities should be omitted because of the competition of a commercial district. If the Union has bedrooms, unless these are in almost daily use, their supervision and care will overbalance the revenue derived from them. If the university itself has an extensive commons, supplemented by fraternity houses for upper classmen, the food service of the Union should be reduced; and similarly, if there is an adequate gymnasium with a swimming pool on the campus, there is little need to duplicate it in the Union.

The population of the building will be large enough to impose upon the plan wide corridors and a spacious concourse on the first floor. During a single day of a major football game probably as many as 40,000 persons enter the building. Women guests should be admitted by a separate entrance controlling a first floor suite of parlor, cloak-room and retiring-room and ladies' dining-room. The dormitories should be arranged to be shut off from the remainder of the building, if for no other purpose than to weaken the conviction of some permanent residents that they "own the house." It is desirable also that the large rooms in which dances and receptions are held be placed in a wing so that the activities that go on there should not dislocate the routine of the rest of the building. To what extent the building will be residential will depend on local circumstances, but it is inconceivable that at least a limited number of rooms for visiting alumni should not be included in the plan.

The success of an organization whose home we have described will depend somewhat on the location of the building. This should be central, especially if the rooming and dining facilities are extensive. Yet

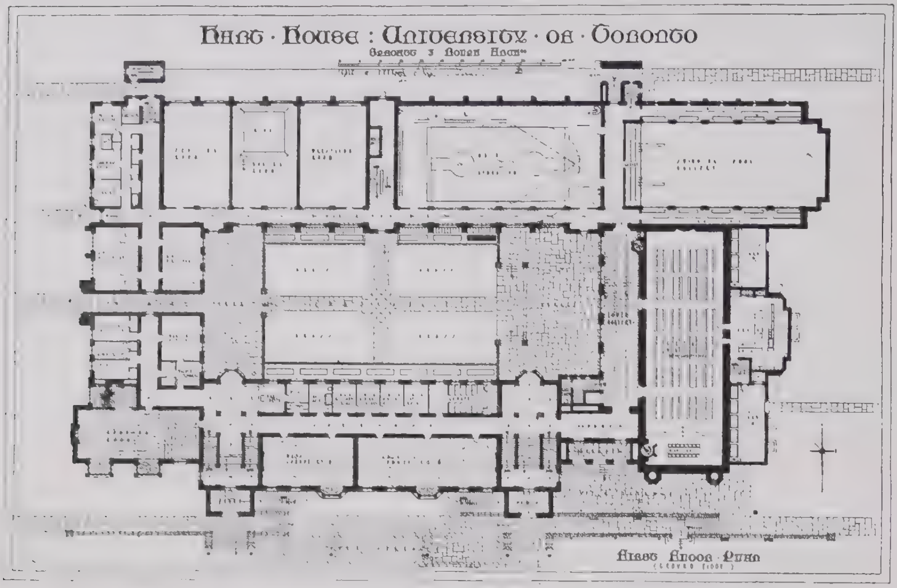


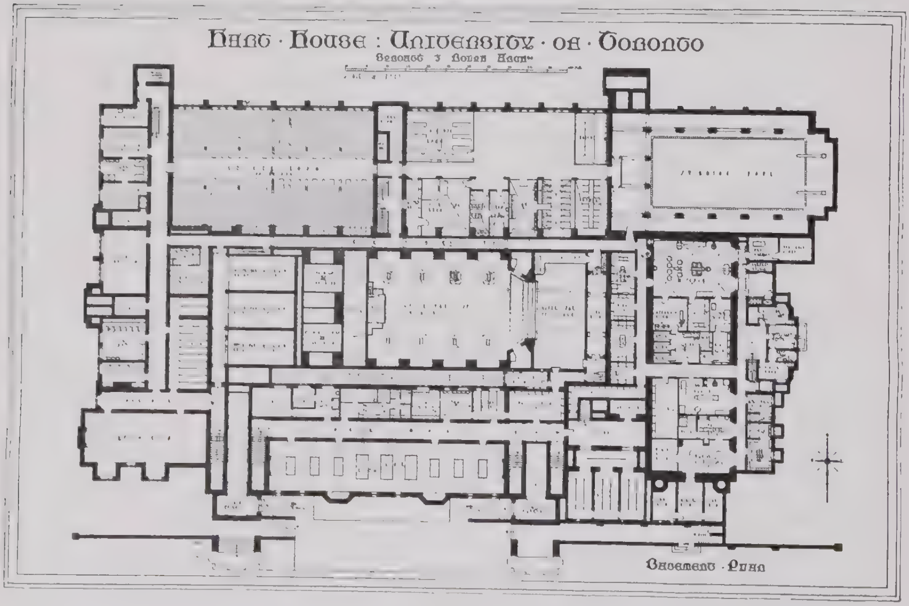
HART HOUSE, UNIVERSITY OF TORONTO. SPROATT & ROLPH, ARCHITECTS the site should be open and attractive and the building surrounded by lawns on which picnics and class sings and other outdoor gatherings can take place. At Wisconsin the site is beside and commands a fine view of Lake Mendota.

The first building of the sort in this country is believed to be Houston Hall, erected at the University of Pennsylvania in 1895. The first to bear the name of its type was the Harvard Union, dedicated in 1901. Rockefeller Hall was built at Brown in 1904. Probably the Ohio State Union came next, and a number of others have followed, such as Purdue and Michigan State College, the State Universities of Iowa, Kansas and Oklahoma. The University of Michigan Union is one of the most interesting, and so successful that, commodious as the building is, a large addition has been planned for it. Enlargements are also contemplated for the attractive Stephens Union at Berkeley. Willard Straight Hall at Cornell has been especially commended by experts on union buildings for the "comfortable, homey feeling" it gives those who enter it,—a quality difficult to achieve in buildings so large as these must be. In this connection we are led to observe the projects set afoot since the war for erecting buildings with funds raised for the purpose of rearing not only union buildings, but war memorials. This has resulted necessarily in giving the structures a monumental character that marks a sharp departure from the more domestic appearing unions of pre-war days. There are now being completed at Wisconsin and at Iowa State buildings of this type. It remains to be seen how their interiors can be treated and furnished to give the desired results.

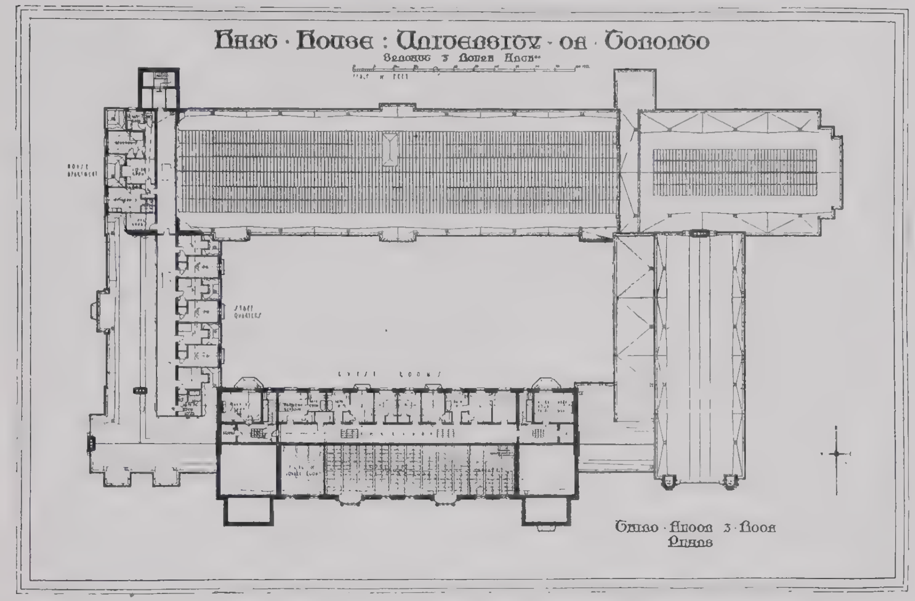
Contrasting with these unions in architectural style, though as large an establishment as any on this continent, is that donated by the Massey family in 1919 to the University of Toronto and known as Hart House. It differs in some important ways from our unions, for it is not residential, and the food service is confined to meals at set prices served in the Great Hall, a faculty dining-room and an undergraduate dining-room. Yet the broad scope of the activities of Hart House is evidenced by art and sketching rooms, rooms for continuous exhibitions, photographic dark rooms for the Camera Club, a chapel, a theatre, a complete gymnasium with subsidiary rooms, a swimming pool, rifle range and squash courts,—all of which are under a hospitable roof that apparently shelters practically every student activity outside the classroom and justifies the director in declaring that Hart House is so much more than a union that it is not a union at all.

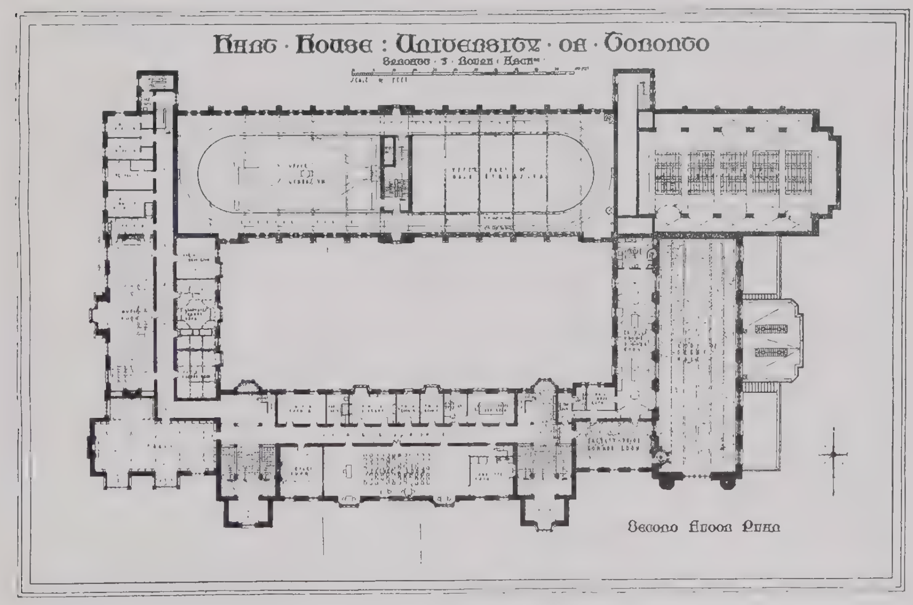
At coeducational institutions a "women's building" or club-house





BASEMENT AND FIRST-FLOOR PLANS OF HART HOUSE, UNIVERSITY OF TORONTO.
SPROATT & ROLPH, ARCHITECTS


Hart · House : University · of · Toronto
Sproatt & Rolph Archts
Scale in feet
Staff quarters
Third · Floor & Roof Plans



SECOND AND THIRD FLOOR PLANS OF HART HOUSE, UNIVERSITY OF TORONTO.
SPROATT & ROLPH, ARCHITECTS

provides for feminine activities. Yet the girl students at Wisconsin have given such valiant help to the building of the Union there that plans have been changed, and instead of having a theatre occupy the third unit, which with the two now under construction will complete the building, this last unit is to be given over to the young women.

Of women's club-houses the most complete example is Ida Noyes House at the University of Chicago.[1] The gymnasium and natatorium are so withdrawn from the main body of the plan that the remaining rooms suffer no loss of their delightful homelike and domestic character. A spacious entrance-hall, a dining-room seating 300, a lounge, reception parlors and library, a trophy-hall, an alumnæ-room, a theatre, a sun-parlor are so treated that there is commodious space without the impression of great size. And it is this that makes the building seem like a home that attracts the girl student in every hour she can call her own. Hearthstone of many buzzing activities as it is, book-lovers are undisturbed at reading in their quiet nooks, for there are many separate rooms to which social functions are confined.

At girls' colleges what seems to correspond to a union on a limited scale is found in activities buildings such as Alumnæ Hall at Wellesley, the Students' Building at Vassar, the Student Alumnæ Hall, with its attractive Mary Lyon Room, at Mt. Holyoke, and The Woman's Building at Illinois. In the plans of these buildings a large amount of space is devoted to music and musical functions, which appears to be the most important single activity of girl students. The fact that space for social mingling has been liberally provided in girls' dormitories would seem to indicate less need at girls' colleges than at men's for large buildings to serve as social centres.

We now reach a group of buildings the most difficult to merge with architectural harmony into a college group: the fraternity houses. We will not attempt to resolve the paradox of fraternities and sororities being forbidden at some colleges and welcomed by many more, but we cannot fail to notice the useful part they play in housing students where housing facilities are scarce and where the college is helpless in providing them. At some institutions the fraternities are so numerous that their total holdings of real estate reach a value of several million dollars. Assuming that fraternities are desired and welcomed at nearly all institutions, the question of where to locate their houses soon arises. Neighborhoods occupied by them can be seen in all the polyglot display of a speculative suburb, where in discordant tones of styles, colors and materials each self-conscious house vies with its neighbor in de-

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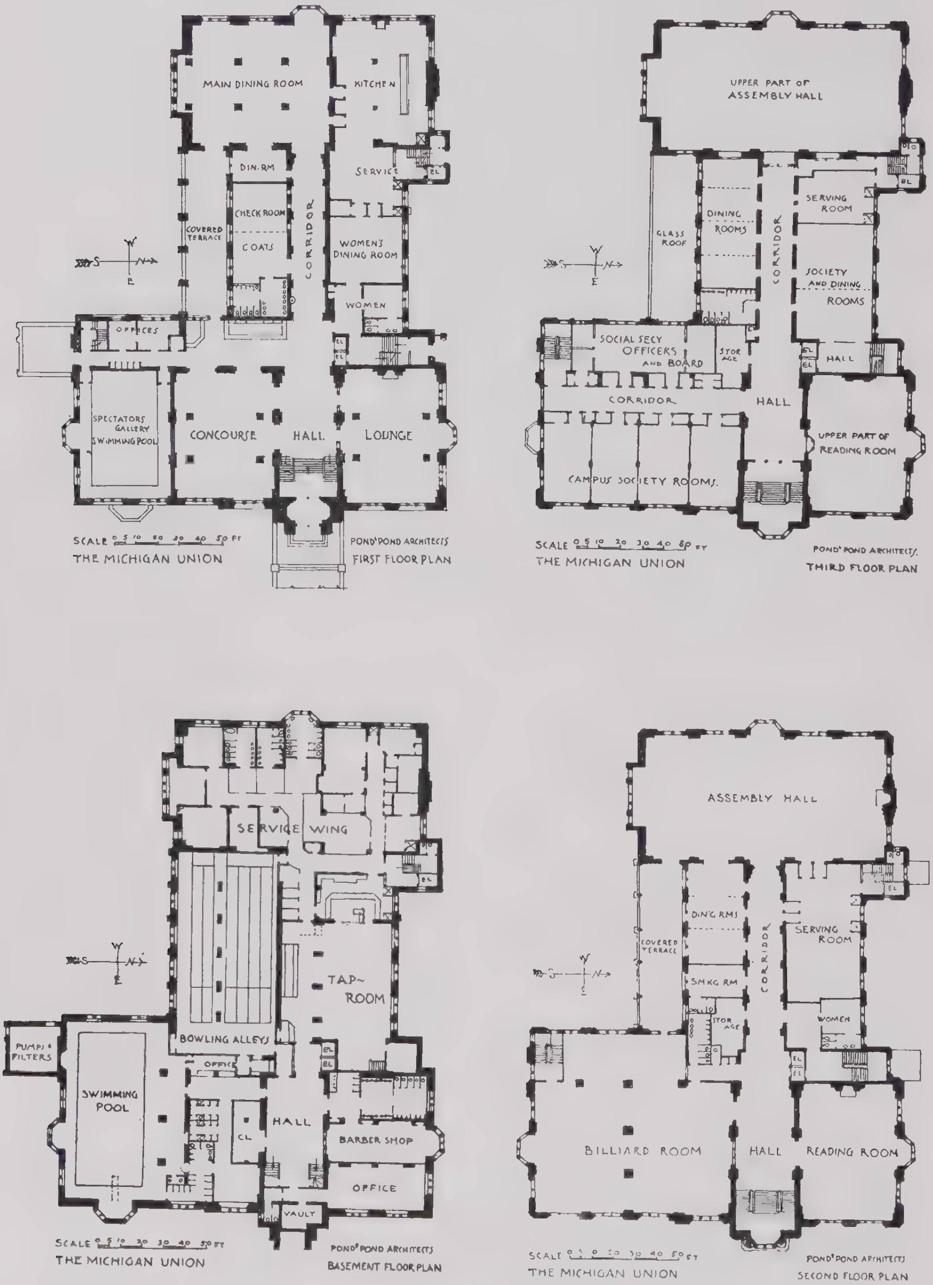
[1] It has these three functional divisions: (*a*) Club house (free for all students), (*b*) Refectory and (*c*) Physical exercises and instruction.

THE MICHIGAN UNION. POND & POND, ARCHITECTS

manding attention and expressing in its own irresponsible fashion the individual caprice of its collective owner. It so often happens that each fraternity wishes to have a house of its own, and each is inspired by a not unrighteous zeal that it shall be finer and more beautiful than that of another—perhaps a rival—society. To immature minds or harassed judgments then is beauty left to be defined and the result to say the least is apt to go far astray from harmony in the architectural scene.

Happily it has been possible in some instances to induce fraternities to curb their own individualities for the common good; and the chapters have gracefully occupied quarters offered them in wings of dormitory buildings or in one of a group of dormitories ordained by the college authorities to be of one and the same style, nay parts of a definite architectural unit conceived and carried out by the same designer. This has been done at Wisconsin. Another noteworthy example is the group of sorority houses completed in 1927 on the Evanston campus of Northwestern.

The principle we would urge to be established is this. If fraternities are to be left entirely free each to design its own building, they should then be relegated to sites in the background of the college group,



PLANS OF THE MICHIGAN UNION. POND & POND, ARCHITECTS unseen from the campus. This will not be a hardship but rather an end to be desired by the fraternities themselves. On the other hand if they will assume their part in aiding a comprehensive plan, they may open up fine architectural possibilities for both the fraternity and the college group, as the examples above named prove. They may then have an appropriate place allotted them where they can but enhance the general architectural scheme.

Such limitations as the following should then be established for each house:

> The approximate extent of the ground plan as defined by the general development plan.
>
> The height of the main cornice or eave fixed with respect to other buildings of the general plan.

(The above two will largely govern the cubage.)

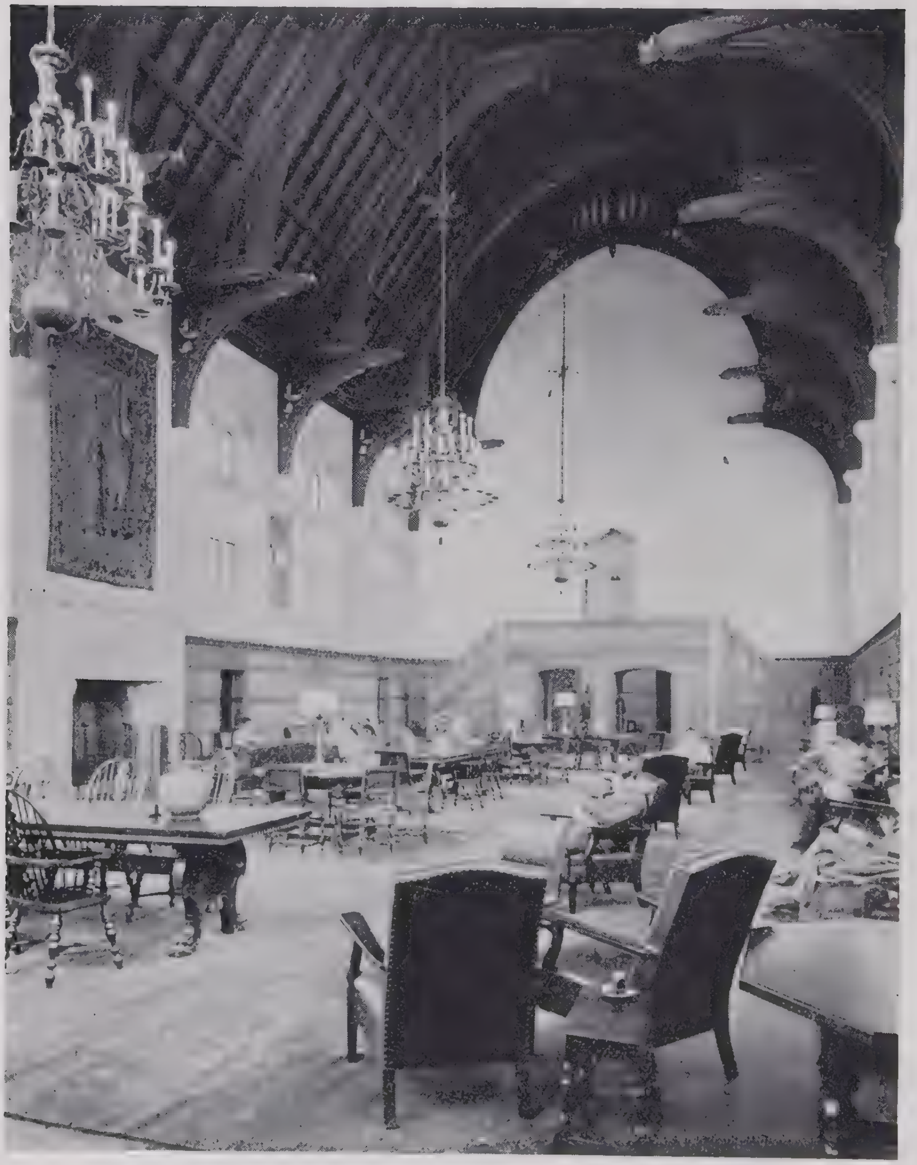
> The limit of money to be expended.
> The architectural style.
> The exterior materials and their color.

Encouragement to build may be effected by the College in donating the site or by granting it upon a long-term lease and by aiding in financing the structure by lending money for construction up to 60 or 70 per cent of the cost of the building at a rate of interest agreed upon, plus an annual repayment of a certain percentage of the principal.

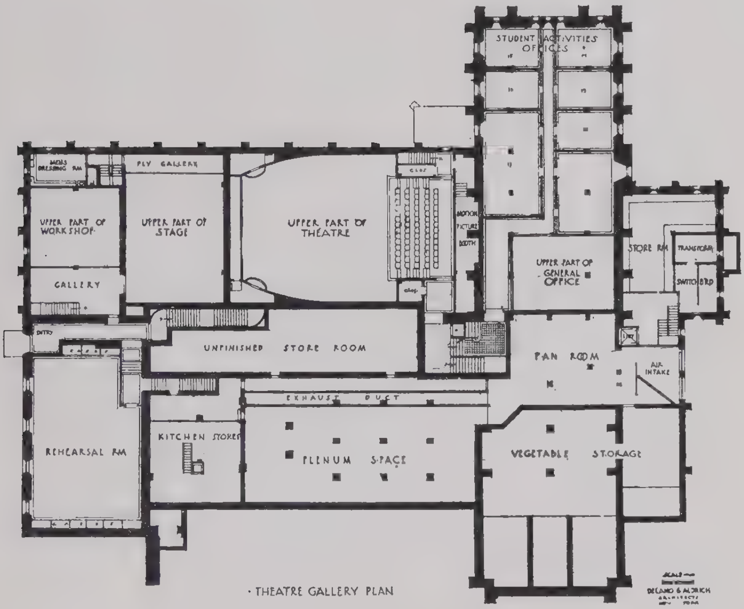
Inasmuch as the architects of these societies are often chosen by popularity and personal influence irrespective of their experience or skill as architectural designers, they should be required at least to submit their designs to, and have them approved by, the supervising architect of the institution (who may happen to be also the author of the general development plan).

Again, if the architect chosen for a fraternity building be a person with little or no experience in the practice of architecture, he should be required to associate himself with another of established reputation.

The foregoing remarks are not intended to convey the impression that all fraternity buildings are of indifferent design. The work of some of the most gifted architects in the country is to be found here and there in the colonies of these houses, and we have in mind as we write an eastern college where the only examples of architectural merit anywhere to be seen are two fraternity houses. Our plea for better design of all fraternity buildings is a plea for general harmony and also for saving these isolated masterpieces from incongruous surroundings.

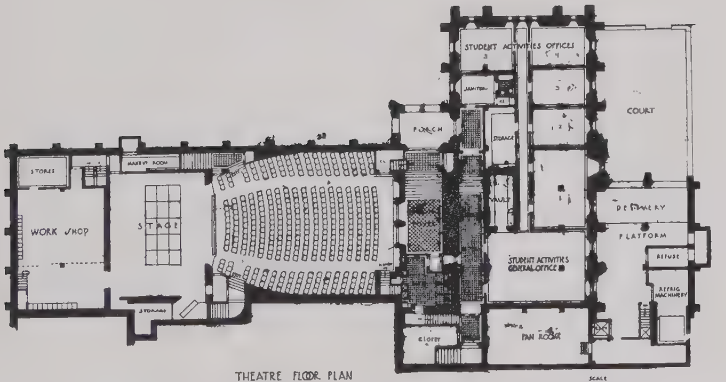


THE LOUNGE, WILLARD STRAIGHT HALL, CORNELL UNIVERSITY.
DELANO & ALDRICH, ARCHITECTS



·THEATRE GALLERY PLAN

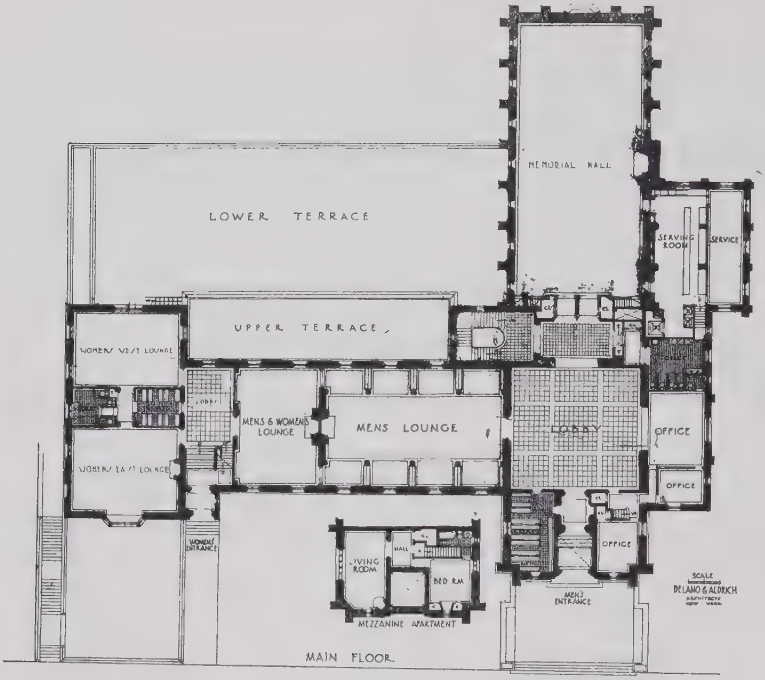
·WILLARD STRAIGHT HALL – CORNELL UNIVERSITY·

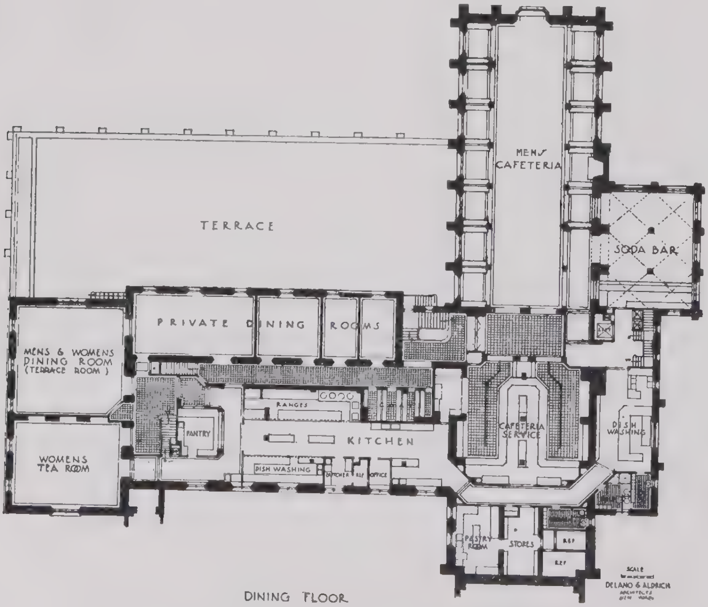


THEATRE FLOOR PLAN

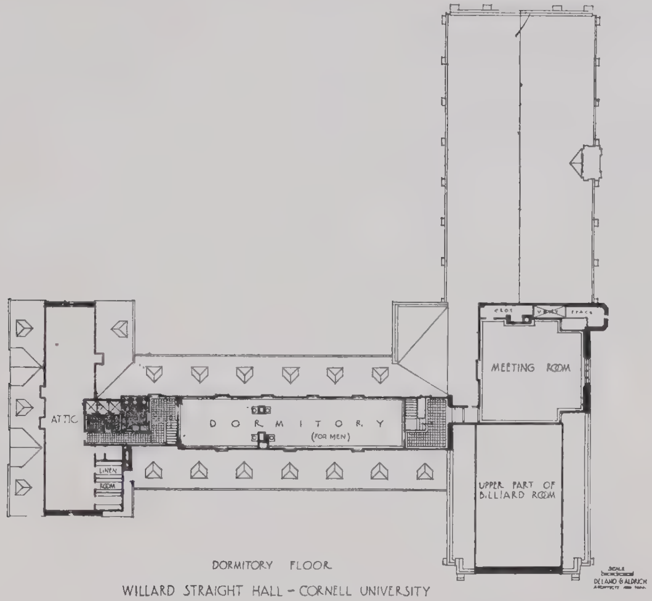
·WILLARD STRAIGHT HALL – CORNELL UNIVERSITY·

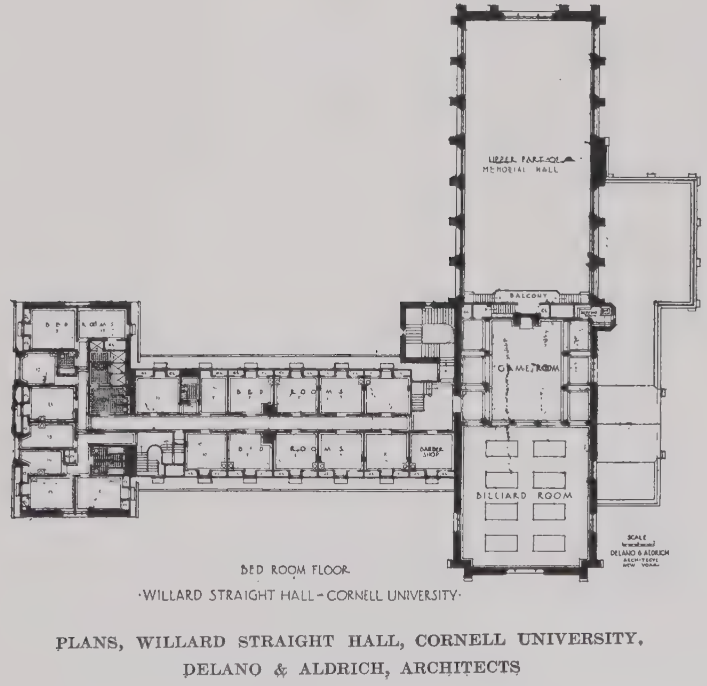
PLANS, WILLARD STRAIGHT HALL, CORNELL UNIVERSITY.
DELANO & ALDRICH, ARCHITECTS





PLANS, WILLARD STRAIGHT HALL, CORNELL UNIVERSITY.
DELANO & ALDRICH, ARCHITECTS


ATTIC
LINEN ROOM
DORMITORY
(FOR MEN)
MEETING ROOM
UPPER PART OF BILLIARD ROOM
DORMITORY FLOOR
WILLARD STRAIGHT HALL — CORNELL UNIVERSITY
SCALE
DELANO & ALDRICH ARCHITECTS NEW YORK


UPPER PART OF MEMORIAL HALL
BALCONY
BED ROOMS
BED ROOMS
BED ROOMS
GAME ROOM
BARBER SHOP
BILLIARD ROOM
BED ROOM FLOOR
·WILLARD STRAIGHT HALL — CORNELL UNIVERSITY·
SCALE
DELANO & ALDRICH ARCHITECTS NEW YORK

PLANS, WILLARD STRAIGHT HALL, CORNELL UNIVERSITY.
DELANO & ALDRICH, ARCHITECTS

Another group of buildings difficult to merge into the general scheme are houses for the faculty. Although one object of the Union is to encourage the mingling of faculty and student, it is obvious that faculty members, especially if they have families, have common interests among themselves and naturally enjoy a home life withdrawn from the campus. In many cases dwellings already exist on the college or university property. In extending the campus bit by bit parcels of land already bearing houses are acquired. These are a limited source of supply for faculty homes. But if new building has to be undertaken, the problem trustees face in providing the faculty with living-quarters is the same as that faced by any head of a family in any community. The psychological, physical and economic advantages of the single or semi-detached house, those of the group of houses or of the apartment will be weighed. The personal income available to pay interest in the form of rent on the capital outlay is not the least important factor. Constructing dwellings in a group, as for example the faculty houses erected a few years ago at Princeton, has the advantage of conserving land and minimizing the cost of construction, each dwelling requiring but three walls. Such close juxtaposition of homes for people of similar tastes and community of interests would seem to have no disadvantages. Another interesting solution is to be found in Kendrick House at Vassar. This is in outward appearance one large dwelling, but with its interior divided into a number of independent apartments of varying size and scale. There are single rooms having the use of a general lavatory and a general kitchenette, while some of the suites consist of a single room and bathroom; others of a living-room, one or more bedrooms, bathroom and kitchenette. A general kitchen and dining-room on the first floor provide presumably the principal meal of the day and serve occupants who do not depend on the kitchenettes. Hallowell House at Wellesley contains housekeeping suites, and its neighbor Horton House a large dining-room, a living-room and single-room apartments.

There are many discriminating families the country over who long to live in small houses amid pleasant grounds and congenial human surroundings, but the real estate markets offer nothing of the sort. The college professor is fortunate in being aided in securing this much desired abode for a comfortable, agreeable and yet simple way of living. It would seem that college presidents, housed as they usually are in dwellings of a bygone day, have stood by in self-immolation content to watch the newer architectural expression moulding other buildings of the institution than the president's house.

Common interests and the gregarious instincts of members of the faculty find expression in their own club. If this finds a home in a union building a commodious suite with its own dining-room is provided the faculty and no separate club-house is needed, but no one familiar with some of the delightful faculty club-houses can want for an argument for a separate faculty gathering place of this sort wherever the institution is large enough to secure the necessary support of numbers. The Quadrangle Club at the University of Chicago is one of the best of the type. A charming foyer and lounge, a writing-room, a library withdrawn and walled with well-chosen volumes, a dining-room that is filled to capacity for the midday meal at least and all the necessary subsidiary rooms for convenience and comfort: these were combined by its architect, the late Howard Van D. Shaw, in a manner that has won universal approbation.

The responsibility of caring for students when ill being inescapable, the smallest college must have a suite of rooms for the purpose, a larger college a separate building, the infirmary. Where enrolment is even larger the number of beds must be correspondingly increased; and if the location is remote from large cities, the facilities the building must provide render it in effect a small independent hospital capable of meeting any contingency. Where there is a large medical school and hospital adjoining the campus, a wing of the hospital may be reserved for students, as at the University of Pennsylvania.

An infirmary, to use the generic term, must be hospitable to students who are ill and to those who think they are. For the former class a few single bedrooms and a number of wards ranging in capacity from three or four beds each to twelve or fifteen should be provided. For the latter class there should be single rooms for the patient to be kept under incipient observation.

Two wards for contagious diseases should be arranged, preferably in a wing, so that they can be shut off from each other and from the remainder of the building, thus obviating the necessity of a separate building for contagious cases. At the Stillman Infirmary at Harvard the Contagious Building is connected with the main structure by a two-story colonnade. The plan should provide a public reception-room and office, a three-room suite for the resident matron, rooms for resident nurses, diet kitchens on each floor, an X-ray room, toilet and bath rooms, linen-rooms, a dispensary, an operating-room with adjoining preparation, sterilizing and surgeon's wash-up rooms, and a room for patients' property. Experienced administration avoids major operations when the patient can be transported to a city hospital. Nevertheless the operating-room of the infirmary should be equipped for any emergency; and if the enrolment is large a secondary room for minor surgery will probably be needed. The food-service department should be complete and independent of other buildings save possibly to the extent of having the food and household supplies obtained through the main purchasing department of the institution. Food cooked in the kitchen will probably be sent up to the diet kitchens in air-tight containers. There should be a pleasant dining-room for the house staff.

It is quite feasible to have a single infirmary building for both sexes with independent spaces for each, as for example, a dual plan with separate entrances and one-half allotted to women and the other to men; or in a smaller building, the first floor for men and the second for women. Nurses' rooms can be put in the third floor or attic.

The well-known principles of hospital construction will determine such practical questions of orientation, the choice of materials and their use in order to produce sanitary, quiet and bright and cheerful conditions. These principles will also determine the details of equipment. Cheerful wards and radiant sun-parlors perform restorative wonders upon patients, for those of the infirmary are usually not so ill that they cannot enjoy attractive surroundings. It is, therefore, not an unreasonable ideal for the designer of the building to make it so well proportioned and agreeably decorated, so delightful to the seeing eye that students with ailing bodies and anxious minds will be willing to enter it, if not reluctant to leave.

CHAPTER XV

SUNDRY IMPORTANT CONSIDERATIONS

The preceding chapters have dealt with the architectural needs of divers departments of instruction, but several branches of teaching remain to be considered. To these the academic form of building is suited, if it is slightly modified. Home economics, for example, requires some classrooms fitted up with gas ranges and appurtenances as culinary laboratories, a group of small rooms embodying the typical elements of a miniature dwelling or model apartment, as well as textile and dyeing laboratories. Partitions 7 feet high, a sink in each room, the installation,—often with electrical connection,—of light mechanical devices domestic in character will be needed. Especially well-planned examples of home economics buildings are those at Wisconsin and at Iowa State College.

Pedagogy requires model schoolrooms or else a schoolhouse so complete that it not only serves for the teaching of teachers but becomes a part of the public school system of the town,—as at Ann Arbor and Berkeley.

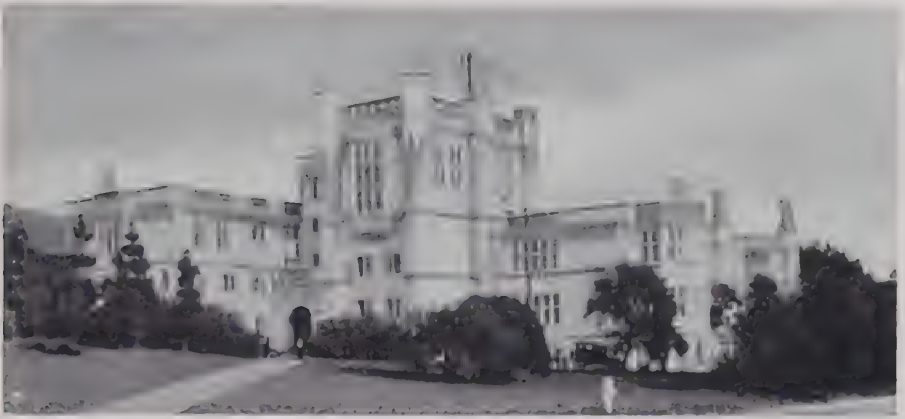
A law school exacts of the academic type of structure that it shall have a large library and special lecture-rooms arranged as trial courts. The law library is the largest and most important of all departmental libraries, rivalled only by that of medicine. Departmental libraries in general, and these two in particular, present splendid opportunities to create something more than a prosaic institutional room for reading and reference. Frequented as they are by a manageable number of responsible readers, these libraries can be made attractive and homelike by means of fireplaces, reading alcoves, a few beautiful objects as permanent exhibits and of furniture giving a degree of that comfort found in a club lounge. A successful effort in this direction has been made in the new Medical Building at the University of Chicago. Other examples of fine departmental libraries are found in Northwestern's new buildings on the McKinlock Campus.

Medical and agricultural schools, together with schools of dentistry, pharmacy and of agricultural engineering are considered beyond our purview; but in dismissing them from our pages we may recommend for the study of persons interested the great medical schools at Harvard, Yale, Chicago, Michigan, Minnesota, Northwestern, Pennsylvania, Johns Hopkins and the vast plant under construction for Columbia. Pre-eminent among the schools of agriculture and allied branches are those at Iowa State College, California at Berkeley, Minnesota, Wisconsin, Michigan, Illinois and Cornell.

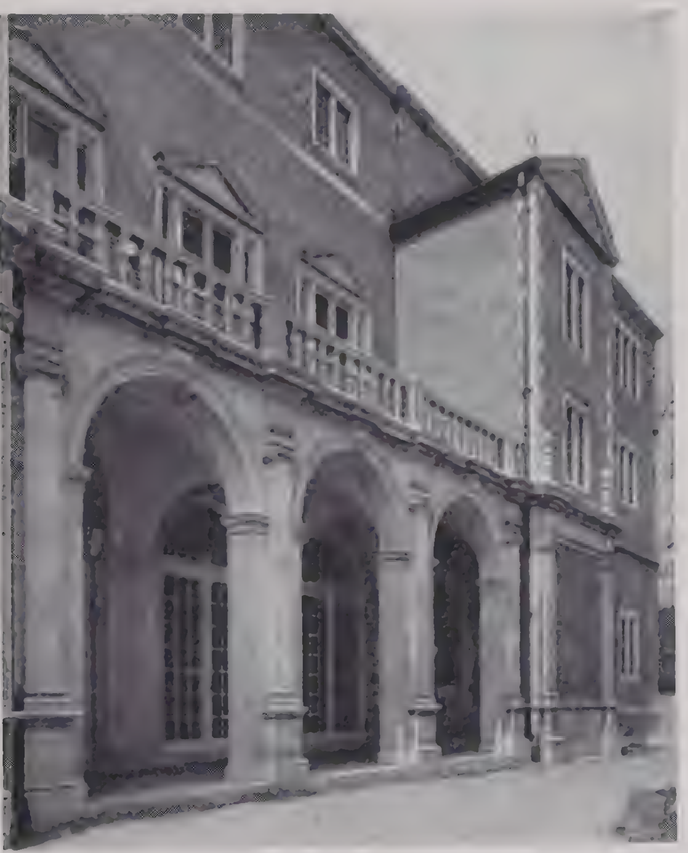
We have now to consider the joining of all buildings into a unified group, and this in two different ways. The first is below ground, the second above ground. For the practical ends of supplying steam, water and electricity the only system of underground communication that can eventually prevail is afforded by tunnels. These should be built for permanence with reinforced concrete walls and roof and large enough in cross section to accommodate present and future piping and yet leave enough clear space for employees to walk through them. It might be urged that it is easy for an institution like Columbia to connect all buildings of its compact group in this manner,—as in fact they are connected,—whereas a far-flung group having great distances would find the cost of tunnel construction overwhelming. What is the alternative? To lay pipes in creosoted logs underground and to run conduits in composition or terra-cotta duct tiles. Both are makeshifts answering only for a time. Even were they permanent, they would fall short of facilitating examination and repair of the piping at all times, the removal of lines that may fall into disuse and the installation of new ones. In fine, underground tunnels is a problem that should be bravely faced and solved by adopting them. Frequently it is possible to locate them so that their roofs answer for footwalks. Thus two ends are secured, and in winter the warmth of the tunnel keeps the footway clear of ice and snow. In order to minimize the length of tunnel, advantage should be taken of basements of buildings. At the development now under construction for the University of Rochester, the tunnel gradually ascends from a distant heating plant to the central campus, in traversing which it is made two stories high; the lower one contains the piping and the upper serves as a corridor for the use of students in going from building to building in bad weather.

Above ground there should be contrived a planting composition sympathetic with the architectural composition. Whether the grouping of the buildings be open and parklike or more closely knit and *arranged*, it is the province of landscape architecture to enhance the general effect.

Although we have now as a nation partially realized Bacon's precept and have "come to build stately sooner than to garden finely" it is probable in time to come there will be a general appreciation of how easily planting can make or mar the effect of a group of buildings; and lay visitors will then quickly sense the charm that skilful



STEPHENS UNION, UNIVERSITY OF CALIFORNIA, BERKELEY.
JOHN GALEN HOWARD, ARCHITECT



STUDENT ALUMNÆ BUILDING, WELLESLEY. CRAM & FERGUSON, ARCHITECTS planting has given to the Alumni Dormitories at Johns Hopkins, for example, and feel shocked at the barrenness of that university on a plateau overlooking a northern city where for the first twenty years not a single tree or shrub was planted. Newness of the site, frequency of building operations or qualities of climate may be impediments to realizing the amenities of the older institutions, where seasoned lawns, mellowed ivy-covered walls and walks shaded by venerable trees attest the procession of years; but it is the duty of artful man ever to strive in bending these lovely processes of nature to his own ends.

Planting in proximity to buildings at least where it emphasizes architectural lines should be of a permanent character and therefore should be confined to the most dignified, the hardiest and least ephemeral species. These will also be the slowest growing. Quite anomalous would be flowering annuals in parlous array at the base of a monumental building. Rather would the ideal there be large and stately masses of species presenting to view *throughout the year* their heavy and impenetrable masses of foliage. Again, imagine a college yard of formal shape surrounded by dignified and substantial buildings destined to stand for centuries; paralleling them broad walks lined with trees. Shall these be oaks, elms, ash, lindens (lime trees), sugar maples? Or shall they be ginkgo, silver maple, cottonwood (Carolina poplar) or any other of the willow family? The answer is obvious. The first demand of trees for the campus should be their strength to withstand storms without injury. Nor should haste to obtain shade quickly influence the choice. Since shade however is an important desideratum, species having broad solid leaves should be preferred to those with delicate or split leaves. We are at a loss to understand why honey locusts were selected to line the rectilinear walks of the campus at a girls' college, where the girls now seem to be the roses amid the thorns. Species without character, such as the Norway maple, the Norway spruce and the pin oak should be avoided. Plane trees (sycamores) and horse chestnuts make a litter and increase the difficulty of keeping the lawns and walks in order. A rapidly growing variety might be alternated with that intended for permanence and cut out as the latter approach the size of maturity, were it not for the danger of the sentiment prevailing against cutting down any thriving tree. Trees should never be placed close to any building. Where teaching is pursued this only nullifies the architect's efforts to provide sufficient light; and at dormitories it robs the rooms of brightness and cheer and increases the oppressiveness of warm weather. The occasional spectacle of dormitories built on the edge of woods or in a grove is indeed gloomy and depressing.

For low-growing masses barberry, thorns, rhododendrons should be employed and especially junipers and other evergreens on account of the beauty and cheer the latter give to the barren scenes of winter. Vines, as well as isolated trees, will be planted by classes, but vines, shrubs and trees must defer to the architecture. It is absurd to decorate a building with fine wrought detail as in window, entrance or cornice of stone or wood and then to let these be permanently hid by vines. Verdure should be sedulously pruned with such frequency as will bid it keep clear of and not obscure architectural lines; and of salient importance is it that shrubbery should never be planted so as completely to obscure the base line of any building.

Grading should be premeditated and definite. If the domain is of formal outline and within architectural confines, changes of level should be made by straight and definitely formed terraces and in these steps may be placed, acting as points of definition. We can see no beauty in grounds of geometric boundaries with a shapeless surface as if they had yielded like wax under a summer sun.

The mistake is often made of not setting the buildings high enough. It is in the nature of an optical illusion that if the campus grade rises but a few inches in reaching a building, the rise will scarcely show and the building will appear sunk. If it is desired that the campus appear level, the rise to the buildings can be as great as 6 or 8 inches in 25 feet and yet insure that effect. This moderate rise moreover is desired for practical reasons of protecting basement walls and cellars from heavy rains. An excuse is expressed, especially in level localities that earth cannot be obtained. Possibly so, but nevertheless every inch in height should be husbanded. If the datum is fixed at a little higher than natural grade rather than a little lower, the excavations from future buildings will help form and complete it. And it would not be much of a sacrifice in a rural community for each student to contribute a load of earth for the grading. Furthermore, earth can be economized by forming one or more sunken courts. These usually attractive means of giving interest to otherwise level grounds have practical purposes also. At Hutchison Court, Chicago, such a quadrangle is a scene for student meetings where the principal actors within the lower level can be seen and heard by the audience surrounding them upon the higher elevation. Further development in moulding the grounds for the needs of audiences are found in outdoor theatres. Those at Berkeley, Charlottesville and Baton Rouge have much architectural equipment, while the vernal stage and seating at Vassar and at the Western College for Women are quite naturalistic.

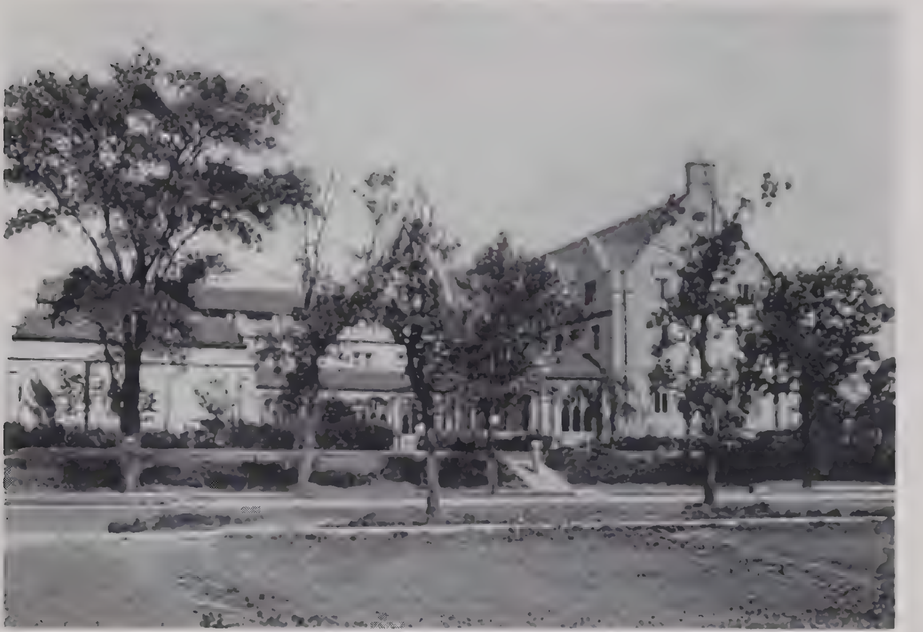
Construction and Materials

Without going into details, it may be said that the principal structural methods pursued to-day in forming the shell of a building are as follows:

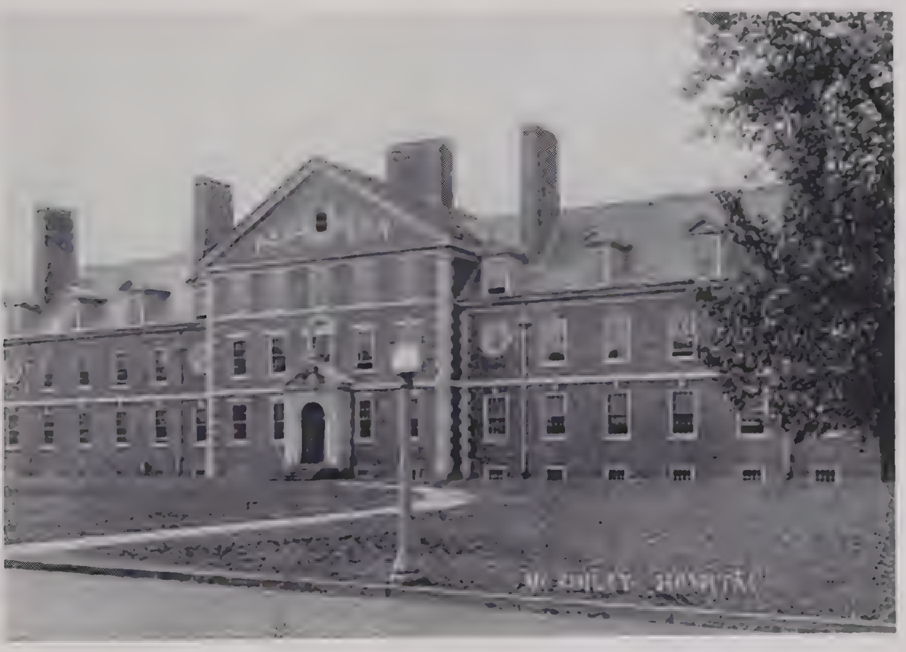
a. A structure of steel girders and columns rendered fireproof by a covering of terra cotta, concrete or masonry, the exterior walls being in the nature of an enclosing curtain.
b. A structure of reinforced concrete, the exterior walls as in "a."
c. Structural steel, wall-bearing; the steel fireproofed as in "a" but the outer ends of beams or girders sustained by the peripheral walls, which must now be heavier to carry the load.
d. Reinforced concrete wall-bearing, that is, floors of reinforced concrete sustained internally where necessary by reinforced concrete columns and externally by the peripheral walls, made heavy as in "c."

The character of the architectural design, the amount of cut stone trim on which speed in rearing the exterior walls depends, prevailing costs, and promptness of delivery of materials in a given locality, weather and labor conditions and the like will have their weight in considering the type of construction to be adopted. The advice of a competent builder on such practical points should be heeded. All roofs should be of steel framing, which it is desirable but not always necessary to fireproof completely. The roof-sheathing material may be of cinder concrete (all other concrete having stone aggregate), gypsum in block or plastic form, or it may be of wood planking. Walls should be furred with terra cotta in all localities but the few highest and dryest. In stories between concrete floor slabs wood furring or stripping is sometimes considered a permissible economy. Foundations in most cases should be protected by French drains and in especially damp localities by a waterproofing treatment upon the exterior. Windows and their frames should be of metal, stairways of steel or reinforced concrete and enclosed in stair halls by means of fireproof doors.

One of the pleasures of viewing works of architecture is to witness new materials or old ones put to new uses. The art of building is ever to discover and to adapt materials to express architectural ideas, for close upon the heels of producing a design is the problem of carrying it out. To be hidebound in the selection of materials leads to monotony and standardization. Nevertheless there are conditions of use that are well-nigh unvarying, and to meet which common experience testifies to a rather narrow choice in the number of materials it is advisable



IDA NOYES HALL, UNIVERSITY OF CHICAGO. SHEPLEY, RUTAN & COOLIDGE, ARCHITECTS



McKINLEY MEMORIAL HOSPITAL, UNIVERSITY OF ILLINOIS.
CHARLES A. PLATT AND JAMES M. WHITE, ARCHITECTS

to use. For finishing materials, *i. e.*, those exposed to view in any completed building, we will offer a few suggestions as applying to localities east of the Rockies and north of the southern tier of states.

Exterior Walls.—The use of brick or stone for exterior walls will depend on the locality. The former should be of good dignified dark cherry-red color and of a naturally rough texture. By "naturally" is meant the texture born of the ingredients. Bricks that are given in their moulding an artificially rough texture cannot be too strongly condemned. In localities where good building stone abounds, it has always been the traditional material for walls. Rarely should it be necessary to transport stone great distances. Study and care in the use of the local stone, however, are to be expected of any architect so that what is wanting in novelty may be supplied by ingenuity. In order that the valuable quality of texture may be given to either brick or stone walls, the mortar should be of coarse material and the joints made conspicuous.

Roofs.—Light-colored gray green or slightly variegated slate, at least twice as thick as the traditional 3–16 inch of the trade, is recommended. In some of the finest examples of college architecture the slates are 1½ inches thick. Graduating the thickness of slate is desirable, but expensive. Tiles might be recommended in some localities, but they should be chosen with great care and æsthetic deliberation. Any well-tried commercial material will answer for flat roofs.

Floors.—In corridors, stair halls and toilet-rooms, terrazza with sanitary surbase 4 or 5 inches high. In dormitories a runner of linoleum added to the corridors. In classrooms, best quality Georgia rift-sawed yellow pine or northern maple. In dormitory-rooms, either of these woods or else linoleum glued to the concrete slab. For stair treads, terrazza or cement, provided with safety treads or carborundum. Floors of laboratories, cement, asphalt or elaterite composition (mineral mastic). Under the urge of economy, cement can be used for all the above places. Floors in gymnasiums must be of maple. Basement floors had better always be of cement.

Interior Walls.—Entrance-halls, wainscoted with marble or matte glazed terra-cotta blocks; or at less expense, panelled with Keene's cement plaster. Corridors and rooms wainscoted with light-colored terra cotta or brick panelled as above or plastered plain hard white finish. Rooms plastered hard white. All hard white to be flat enamel painted. For initial economy, all the hard white plaster may be slightly tinted with mineral color to make it sightly until a time when painting can be done. Laboratory and work-shop walls of semi-vitreous brick or matte glazed terra cotta.

Ceilings.—In important entrance-halls and rooms ceilings should consist of plaster upon suspended metal lath. Elsewhere the under sides of floor slabs can be plastered using a special adhesive preparation. If the slabs are smooth, they can be painted. If not left smooth by the pouring, they should be made so before painting.

Toilet-Rooms.—Floors of terrazza, walls wainscoted with light-colored marble. The cubicles also of marble with wood doors. Or, walls may be of vitreous brick or matte glazed terra cotta and cubicles may be of metal. This material, however, especially if metal doors are used, is a source of noise. In Boston and vicinity terrazza is cast with great skill into slabs a little thicker than marble and used as satisfactorily for wainscoting and cubicle partitions as marble would be.

Walks.—For campus walks slabs of split flagstone or heavy slate are far more attractive than cement. A good quality paving brick, if laid on a concrete base, looks well, especially if the buildings are of brick, and is long enduring.

The use of fireproof materials has brought acoustical problems to the fore. Concrete, terra cotta and expanded metal, whether plastered or not, are more reverberant and resonant than the wood studding and lath construction formerly concealed in walls. Modern patent plaster of itself and the method of its application is responsible for some of the problems of the acoustical engineer, without whose advice no important building should be planned.

Fireproof construction is necessary for the safeguarding of life. From the point of view of the building owner, it has further advantages. It minimizes loss from fire and correspondingly the insurance charges; it keeps down the cost of maintenance, as it also insures the least yearly depreciation. The term "fireproof" is used with apologies. No building is absolutely fireproof; that is to say, any fire, if it lasts long enough, will injure the best constructed building. A better term and one growing in use is "fire resistive,"—that is to say, a kind of construction that retards the progress of the fire until means arrives to put it out. In fact, the "time period of fire resistance" is now the modern basis for the fire testing of materials.

Underwriters regard college buildings generally as bad risks. Among the reasons for this may be mentioned the following:

Smoking and matches.

The large number of small fires maintained on the college property and the danger of their getting beyond control.

The presence of laboratories in which explosions may occur.
Moving pictures.
The separate rooms of dormitories independently maintained, but always with hangings, combustible ornaments and accumulations in closets. Accompanying this condition is the difficulty of oversight.

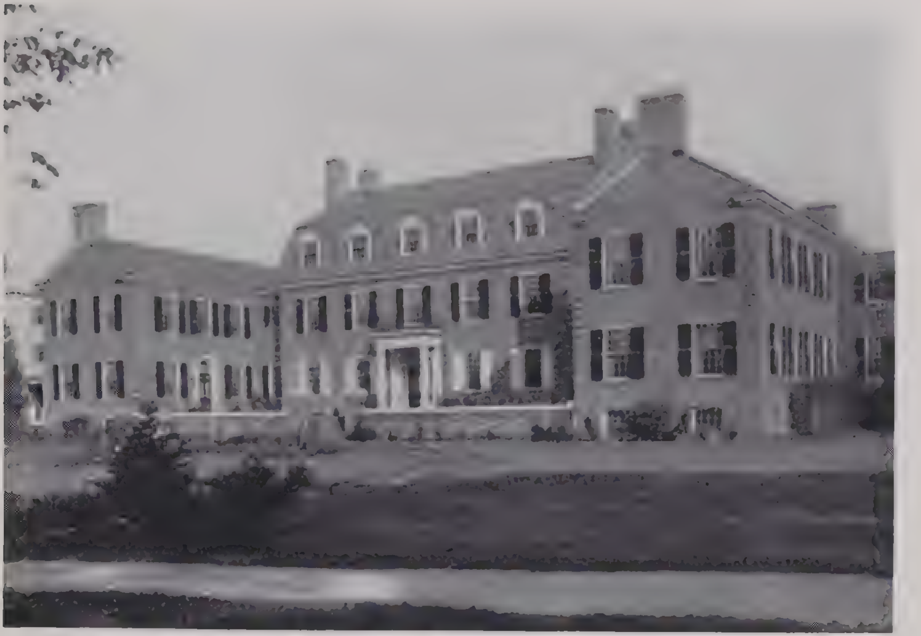
The improvising of old buildings, *i. e.*, putting them to a use to which they were not originally intended.
Additions to wood buildings. Even where these additions are of brick or stone, a proper barrier may not be provided to prevent the old building from endangering the new.

The isolated localities of many colleges and universities, and absence of any organized fire department.
The large number of people of different kinds and degrees of intelligence using college buildings.
Vandalism.

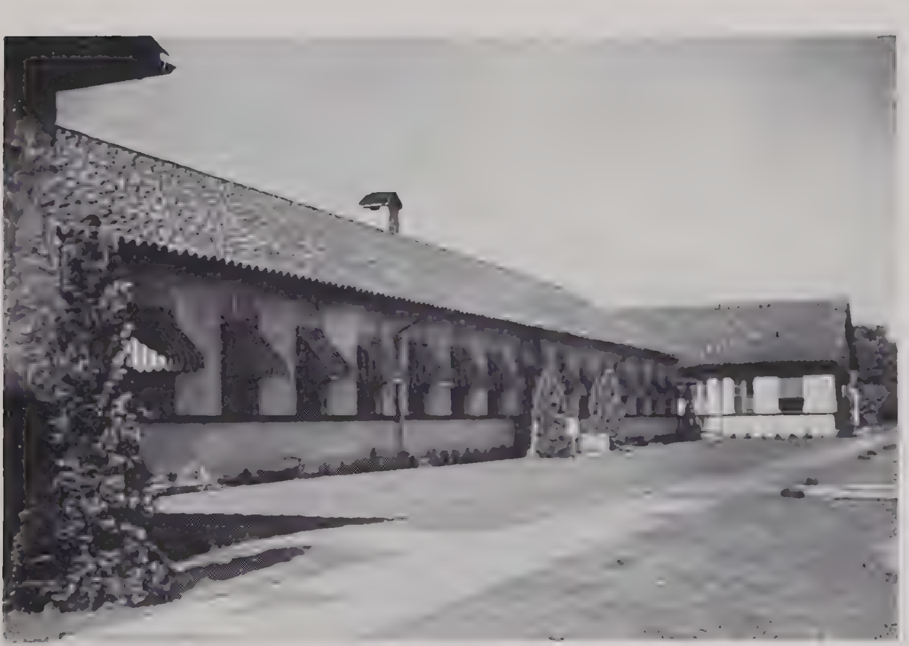
The last two named constitute the human element that bulks large because it cannot be estimated or foretold. Location and construction can be measured by the scale of past losses, but the caprice or heedlessness of individuals is always an unknown quantity. Business buildings by comparison contain groups of people more nearly of one kind, similar in interest and knowledge and an understanding of the place in which they work. But at a college it is quite otherwise. Heedlessness and irresponsibility are baffling problems. Where is the college officer who would check the ebullition of spirits that stages a bon-fire celebration after a football victory. "Let joy be unconfined," is the cry. Perish the thought of consequences from the habit of the winds.

Those not acquainted with the technic of building frequently make the mistake of imagining a structure to be fireproof when it is not. The mere use of noncombustible materials does not suffice. It depends on how they are used. The cost of these materials will have been wasted unless the design properly combines them. For example, if there is any structural steel not covered with at least 2 inches of noncombustible material, the condition will not be what is commonly known as "fireproof." This and kindred facts suggest the possibility of there being now many more than one college complacent in the belief that it has "fireproof" buildings when it really has not.

Colleges should demand that the main body of their structures, at least, such as the first, second and third stories in a 3½ story build-



DICK HALL'S HOUSE, THE INFIRMARY AT DARTMOUTH.
J. FREDERICK LARSON, ARCHITECT



ALLEN HOSPITAL AT OBERLIN. CASS GILBERT, ARCHITECT ing, be made as fire-resistive as modern practice and materials permit. Beyond these confines some economies can be indulged in, as for example, wood sheathing of the roof construction as already specified (page 266). This will not endanger life, and the cost of making the entire roof noncombustible may be out of proportion to the small charge, if any, the underwriters may make for the use of wood here.

Long vertical and horizontal channels for drafts, such as long corridors without any means of subdividing by fireproof doors, and stair wells not properly shut off from corridors are a menace. Standpipes should be installed with outlets and fire hose at each floor; and a sprinkler system, as recommended by the underwriters for kitchens, laboratories and for work-shops where wood is used, might easily be installed.

The fact that many institutions without any fireproof buildings have never had a fire and the spectacle of millions of families who have always lived in frame buildings and have never had a fire points to this one vitally important thing in all college and university maintenance, *i. e.*, good housekeeping combined with efficient janitor service. No excellence of building construction can cope with accumulations in closets and under stairs, careless storage of chemicals or defects that may discover themselves from time to time in wiring or insulation. Watchfulness of these is primarily a janitor's duty, for it applies to things when they are not in use. The instructors and the house matron are to help the situation when it concerns things that are in use, such as dangerous acids, gases that may be ignited, motors overheated, the use of electric irons, torches, curling irons and the like. Of all the known causes of fires, the one classification "matches and smoking" heads the list for frequency, and "spontaneous combustion" comes next. It therefore behooves all those in charge of a college plant to focus their preventive efforts on these hazards.

Another continuous task is the maintenance of buildings with respect to keeping them in repair. Parts exposed to the elements are the most vulnerable. Roofs, chimneys and copings, indeed everything that is uppermost and hence facing the sky should be frequently inspected. Yet it is these portions that are often left to their own solitude for years after the building is completed. Consider limestone copings as an instance. Of fine natural stone these may be, in lengths of 30 or 40 inches, and carefully laid to give the utmost protection to the wall, the entire thickness of which they cover. Yet these stones, withstanding as they must a temperature variation throughout the year of probably 100 degrees Fahrenheit, are sure to expand and contract. The joints will then open and eventually part with their mortar. Rain is then free to make its way into the wall below. Sheet lead under the coping and plastic jointing material will help, but all plastic cement dries out in time; and in any event, the conditions described emphasize the need of watchfulness. Repointing of these upper parts of the building and especially of chimneys, calking elsewhere to cope with the incorrigible habit of materials to shrink and swell, repainting, promptly correcting pipe leaks and keeping all drains free from obstruction are some of the duties a grounds and building department should perform in caring for any building. Let no one be heedless because the structure is new. Good construction supplemented by this care should result in keeping down the maintenance charge over a period of say twenty years to 1½ per cent of the original cost of the building.

EARL HALL, HEADQUARTERS FOR STUDENT RELIEF WORK, COLUMBIA. McKIM, MEAD & WHITE, ARCHITECTS

There is no buildings and grounds superintendent who will not divulge in moments of confidence shocking instances of vandalism. A favorite pastime with a certain strain of students is the cutting of wood door panels and injury to locks and plumbing. One of the writers visiting a chemistry building in the South, where the windows always stand open, noticed signs hung in the laboratories forbidding anything to be thrown outdoors. Why this prohibition with the laboratory only eight or ten feet above the ground and lawns about the building? Upon going outside the answer was seen. The entire exterior of the building was of buff stucco. The walls below the laboratory window sills splayed outward in descending to the ground, and with good architectural effect. Under every window these walls had been permanently stained by the habit of students of tossing residues of chemicals out of the windows. Girl students as well as boys have their urge toward mischief. The operation of standing upon a shower drain while keeping the water running until it runs over the curb of the stall and overflows the room is one that affords to some students an inexpressible joy.

Depreciation and obsolescence are closely related. The one implies that the building is outworn; the other that it is outclassed by buildings of superior design or meeting newly discovered requirements of the particular branch of teaching or other use which the structure serves. Some colleges keep no depreciation accounts because as they say, "We don't expect to sell out." Yet it would seem advisable in college accounting to make some allowance for wear and tear over long periods. In this matter the source or sources from which the institution obtains its income may be the deciding factor. Obsolescence cannot be avoided: it can only be postponed. Examination of the most modern buildings and keeping abreast of the latest ideas in their planning is to place the new building in the forefront of progress when erected, but to expect it to remain so is as unreasonable as it is difficult to foretell knowledge or to forestall discovery.

CHAPTER XVI

PROFESSIONAL ADVISERS AND THE BUILDING OPERATION

Upon realizing the inadequacy of its buildings the first step an institution should take is to have the plant examined, surveyed and architecturally appraised. Even if no funds are available for immediate building, but only the unavoidable minimum for yearly repairs and replacements, this survey will be useful. If buildings are not worthy of repair, no money should be wasted on them.

If, on the other hand, an orderly programme of future building is contemplated, to progress at whatever speed, sites should be determined in accordance with a development plan considered in Chapter Three. General advice upon all matters pertaining to building now and in future should be obtained and carefully weighed by the board of trustees through the medium of one or more sub-committees it should appoint. If the institution and its undertakings are small, one committee suffices; but if the property is large and the development problems proportionately so, there might be the "committee on architecture," otherwise known as the committee on architectural plan "or development." This body should have permanent standing and supervisory functions. When construction proceeds, the operation should be directed by another body known as the "building committee." Each of these committees should consist of three or, at the most, five persons.

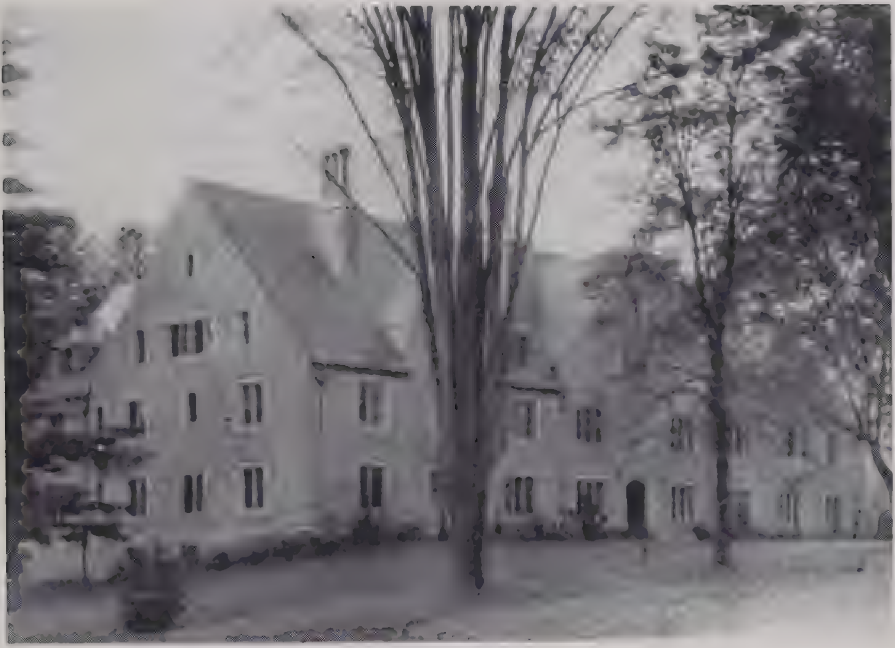
For this consultative and preliminary work an architect should be employed. His appointment may have far-reaching consequences for the institution, so much does it lie with him to make or mar. How then should he be selected? It sometimes happens that human contacts are not in such a state of equilibrium that an impersonal choice can be made. Is the local man to be chosen and only because he is the local man? If the community is remote from large centres where architects congregate, there will be a strong feeling in favor of so doing, the weight of this influence being perhaps in proportion to the isolation. Is every graduate of the architectural department of the university to have a chance? Is his alma mater reasonably to be expected to lend him a helping hand toward his goal of becoming a luminary of his chosen profession?

These considerations seem to us to becloud the main issue: that of finding the best man for a given important task. We will not attempt to resolve these questions, but rather will we endeavor to set forth the qualifications which should be possessed by him in whose hands the architectural destiny of an institution is to lie.

By the word architect is meant a person of absolute probity, practising upon a purely professional footing with no direct or indirect interests in any contracting concern of the manufacture of building material. He should be tried and proven by his successful works of the kind of buildings under consideration. He should have imagination, taste and inventiveness, all of which are as necessary qualities of a designer as that uncompromising attitude toward himself that bids him when he has produced a commonplace design, to own it as such and try again. He may be compliant with others upon details, but he should be unyielding when faced by a major issue which he knows will spell the architectural success or failure of the project. He should have "the professional attitude," which is that of disinterested responsibility toward the community while securing the best solution for his client. He should be open-minded to suggestions, willing to investigate, and if necessary, to revise his plans so long as they can be improved. He should have a thorough knowledge of the type of structure under consideration, its development in the recent past, how it is being treated elsewhere and the present tendencies affecting it. He must have in his organization a technical knowledge of materials and of economic and trade conditions, which will enable the utmost of beauty and utility to be obtained for a given cost; and moreover, he must certainly have an executive ability with which he will co-ordinate the labors of all concerned to obtain the best results. If a person combining within himself these qualities is found, he may without misgiving be intrusted with the work and given that whole-hearted confidence which will animate him to the best endeavor. Responsibility implies control. The greater the centralization of authority in the architect, the better the service is likely to be rendered the institution. Divided power and conflicting authority are other names for chaos.

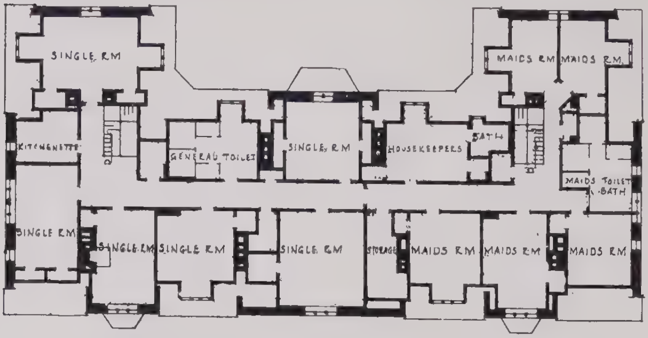
One or two of the qualifications described above may not be necessary to him who is known as a "supervising architect."

The duties of a supervising architect are specifically to give advice to the building committee or other designated officers upon the general architectural development of the institution, the location, style, materials, character of buildings contemplated and the selection of executive architects to design them, to examine sketches and plans of proposed new buildings, to pass judgment on their suitability and to advise with a view to bringing the design of the building into harmony

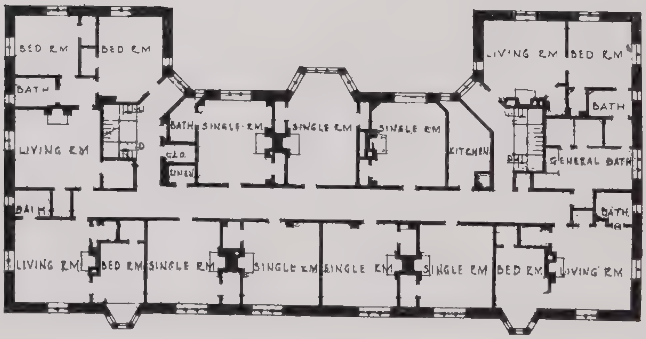


KENDRICK HOUSE AT VASSAR. YORK & SAWYER, ARCHITECTS

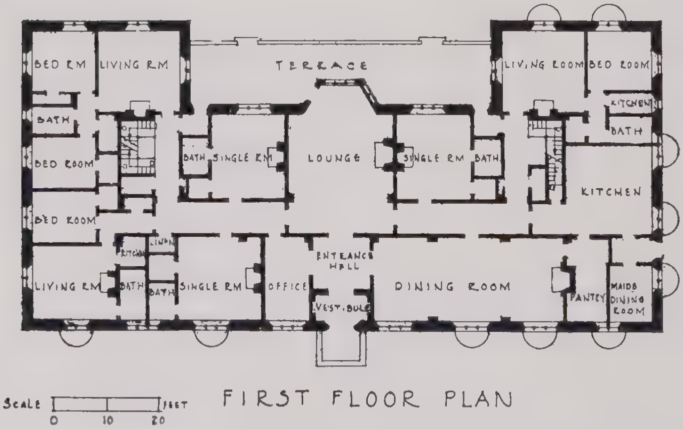
FACULTY HOUSES, PRINCETON. PARK & MORGAN, ARCHITECTS



THIRD FLOOR PLAN



SECOND FLOOR PLAN



FIRST FLOOR PLAN

PLANS OF KENDRICK HOUSE AT VASSAR. YORK & SAWYER, ARCHITECTS with the general development plan already adopted. This service in a word is that of broadly reviewing.

A second phase of the supervising architect's service consists in his acting in a close advisory and co-operative capacity with the building committee and the executive architect of a new building, and to contribute of his experience in meeting the detailed needs of the institution with due regard for its means. His duties then include an examination of all preliminary sketches, working drawings and the specifications and to make suggestions of judicious additions, changes or omissions as occasion requires. In short, this rôle may be described as a consulting or advisory architect for a particular building.

In engaging a supervising architect it may or may not be stipulated in the agreement that he is ineligible to become the executive architect of any particular building. Some members of the profession believe the two rôles to be incompatible, that a supervising architect cannot disinterestedly advise in that capacity and nominate executive architects for particular buildings if there is any possibility of his becoming the architect for one himself. Yet the institution may have such confidence in the person it has selected as its adviser that it refuses to look elsewhere when the time comes to build. In vain may the supervising architect renounce the opportunity offered him to design a building. If the building committee wants him to do so, what else can he do but accept? No one's ethics can be impugned when such a situation is frankly avowed and understood.

A satisfactory solution is to have the supervising architect carry out the planning and erection of a few initial buildings. This gives the project a start in the direction contemplated by the development plan. Later, opportunities may be opened for other architects of equal capacity and aptitude in the chosen style. But it is to be understood that all would work under the general direction and counsel of the supervising architect.

The executive architect is he whom the public commonly understands by the name of architect and is the one intrusted with planning and supervising the erection of a building. He should have all the qualifications named above and as many more as beneficent Nature in her best mood may have bestowed upon him. He may be selected by canvassing the field to find one who has the most points to his credit. Confronted with the problem of erecting a building, it is the plain duty of the building committee to make a tour of inspection of other institutions where modern buildings of the type in question exist and which may be studied as models. In doing this the names of architects specializing in certain types of structures will be discovered. This should be supplemented by wide and judicious personal inquiry about architects and by the examination of files for the past five or ten years of the chief architectural magazines. These present a complete record of all the better current architecture throughout the country.

Another manner of obtaining an architect is by means of a competition. This we hesitate to recommend. A competition does not necessarily insure the selection of a competent architect. The author of pleasing drawings that win the approval of the jury may lack the skill to carry out the details and the executive ability to guide the undertaking to successful completion. We are in accord with a large body of professional opinion, which is firm in the belief that competitions are in the main of no advantage to the owner. They are expensive and take time. General "open" ones will not attract the best practitioners. "Limited" ones command at least a higher grade of talent. For public buildings they are commonly adopted in conformity with legal requirements, since public funds are to be spent. Competitions however are often "the only way out" when boards or building committees are so importuned by architect friends and the friends of architects that members of the committee find themselves unable to make a choice of an architect by the best method: the sole basis of his fitness for the work. If a competition there must be, it should be held in the manner prescribed by the American Institute of Architects. The three primary requisites are:

That there be a professional adviser.

That there be a jury of at least three members, one of whom is a practising architect.

That the programme contain a contract for architectural services in accord with good practice.[1]

The architect chosen, he should be provided with a "programme" or list of requirements. This should stipulate the space required, accommodation and capacity (the number of students at a given occupation), the number of rooms and their relation to each other, intercommunication, large and heavy objects to be accommodated, etc., etc.; but it is imperative that this programme have some degree of elasticity. The architect may come into close contact with the administrative officers and especially with the teaching staff who are to occupy the building;

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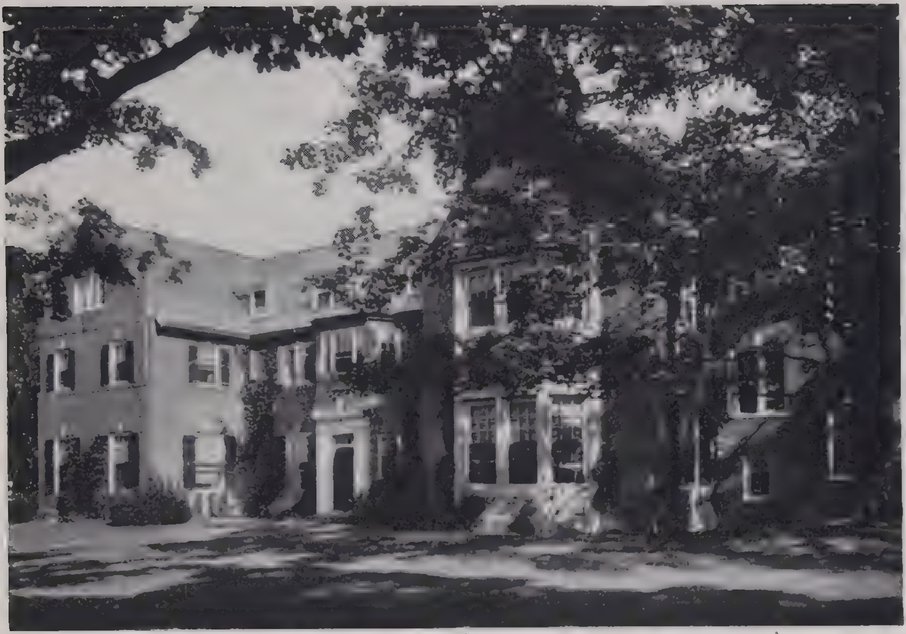
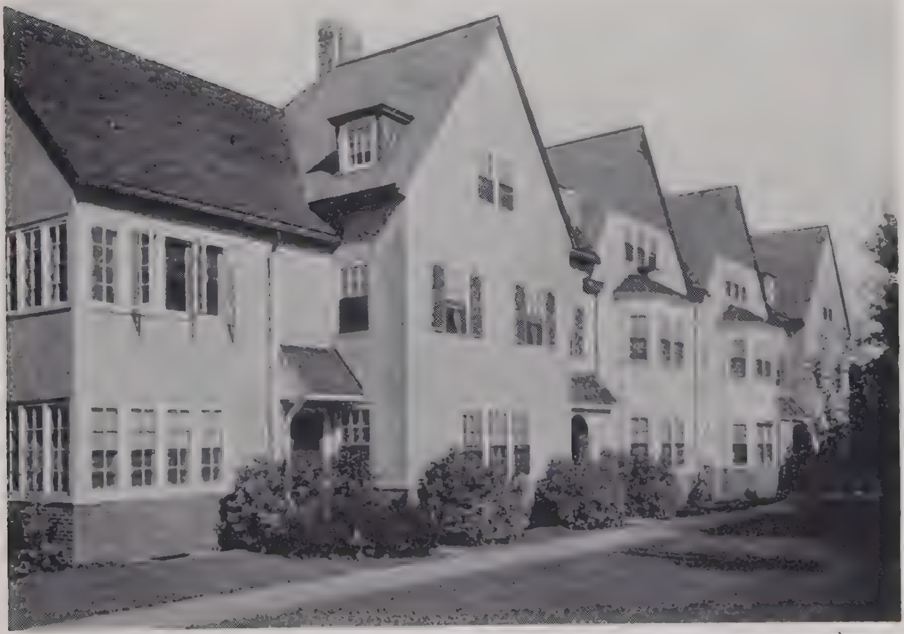
[1] Complete directions for conducting a competition in the interest of both owner and architect is contained in "Architectural Competitions—A Circular of Information," A. I. A. Document No. 213. It can be obtained gratis by applying to The American Institute of Architects, The Octagon, Washington, D. C.



HORTON HOUSE, WELLESLEY. (SINGLE ROOMS FOR FACULTY.)
ELIZA NEWKIRK ROGERS AND GEORGE F. MARLOWE, ARCHITECTS



HALLOWELL HOUSE, WELLESLEY. (HOUSEKEEPING SUITES FOR FACULTY.)
ELIZA NEWKIRK ROGERS AND GEORGE F. MARLOWE, ARCHITECTS

but this contact should be systematic and carefully controlled. All directions given the architect and communications with him should be with the knowledge, or under the surveillance, of that important personage, the chairman of the building committee. If the institution is large, highly organized and with executive sagacity in the administrative department, he may delegate the comptroller or the superintendent of buildings and grounds to maintain this contact with the architect for all matters of detail; but the chairman of the building committee should never abdicate to any other person. He must be prepared to intervene with commanding authority when that all too frequent impasse is reached: the teaching staff heedless of expense or architectural appearance insisting on their requirements, quite incompatibly with the limit of cost and the demand for architectural merit made upon the architect by the building committee. Size and cubage measure cost. Between this upper and nether millstone the architect writhes in vain until the chairman of the building committee comes to the rescue, stills the discordant voices and decrees either that demands be curtailed or the limit of cost be increased.

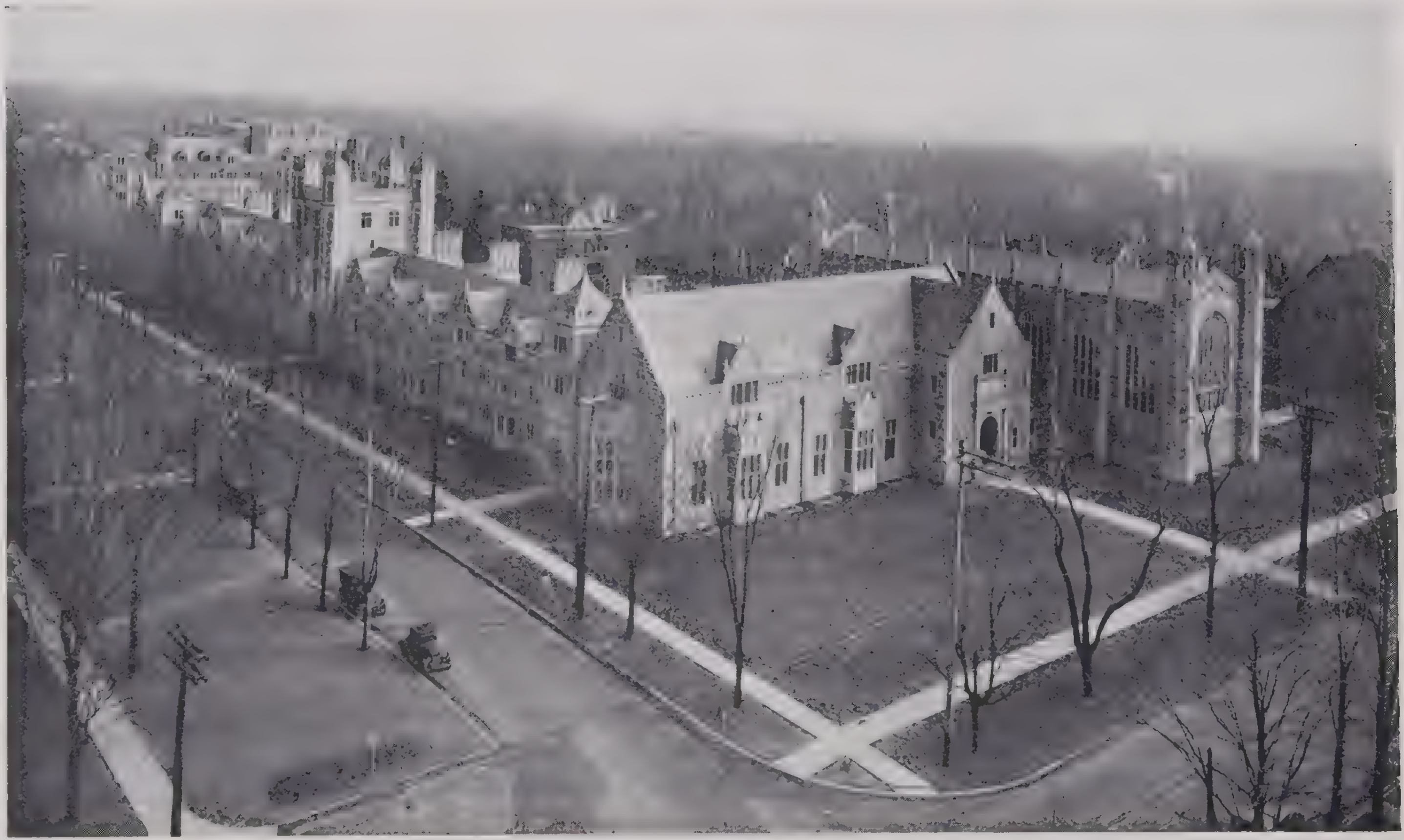
The employer of the architect is not the staff but the corporation represented by its building committee, and it is only fair to the architect that he should be under the authority of that committee through the one person of its choice, acting as chairman, and who alone communicates the united voice of the committee to him. Otherwise the architect is greatly confused, swayed to and fro and hampered by the unmatured opinions and impulsive desires expressed by individuals. Indeed, such unauthorized communications to the architect lead to a confusion of cross purposes and not only cause serious delay but often react to the building committee's own embarrassment. To many readers this will seem gratuitous advice. But the kind of situations that are frequently happening is represented by the following typical case.

A president and two trustees make an initial call upon an architect of some repute as a designer of college buildings. Terms for his services are agreed upon and confirmed by written contract. As the architect proceeds with the three buildings requested of him, the college authorities are impressed with his designing, the orderly procedure of his office, the conviction which accompanies his advice, and especially the accuracy of his forecasts of costs resulting from his experience in having planned many buildings of the type in question. The board soon has such confidence in this architect that it insists upon his overseeing all the building operations of the college. At this juncture another architect appears with plans for a fourth building, a gymnasium.

This architect had already been engaged by one member of the board, informally by word of mouth, or at least permitted to proceed and without knowledge of his fellow members. The plan is brought to Architect No. 1 who realizes at once that it cannot be built for the sum now contemplated. Architect No. 2 is asked upon what basis he has proceeded, by what authority was he engaged, how did he obtain his data, who formulated the requirements, by what rosy species of hope did he expect to erect for $80,000 a building that would obviously cost $140,000. Whereupon the proverbial fat began to sizzle in the oft-known fire. The board was obliged to waive responsibility for the act of one of its members who now realized his mistake and must have felt some sting of criticism. Architect No. 2 was condemned for having proceeded without a definite agreement or authoritative data. It fell upon Architect No. 1 to unravel the situation. This he could only do by having No. 2 swallow his loss of time and money in producing all too willingly his plans that came so wide of the mark, and to start afresh. Architect No. 1 sketched a building that could be erected for the allotted sum. Architect No. 2 developed this design, completed new working drawings, obtained satisfactory bids and the building was erected. But at what useless travail, embarrassment and delay, all of which could easily have been avoided by establishing the proper relationships between individuals! There was an absence of ill motive, but a presence of loose methods.

The fundamental data upon which all physical changes at an institution must be based are contained in a reliable topographical survey of its property. Although most institutions employ civil engineers from time to time, it is surprising to find what little importance some buildings and grounds departments attach to the need of one comprehensive and accurate map. The occasions on which reference to it can profitably be made are innumerable. As the map should be kept up to date at developing institutions, it is well to employ a capable local engineer continuously so that data may be obtained from him whenever needed.

It is in fact the part of the college to provide the architect with a survey, and it is clearly implied that this survey should be reliable; yet it is not uncommon for the architect to have to piece together fragmentary surveys made at different times by different engineers and to struggle to reconcile discrepancies. Upon beginning his working drawings, a survey is furnished him. Upon his finding it incomplete he asks for supplementary data. Another map is provided. Then the architect receives a letter pointing out a correction to be made in Map No. 1. Working at close range to fit his building accurately



THE LAWYERS CLUB, UNIVERSITY OF MICHIGAN. YORK & SAWYER, ARCHITECTS to the grades, he discovers an apparent discrepancy to be cleared up. Map No. 3 is sent him, but with the information that Map No. 2 at another point remains correct and takes precedence over Map No. 3.

The case is known of a science building over the exact orientation of which there was discussion between the teaching departments and the architects for over a year,—even the college astronomical department lending a hand. When construction was begun and the position of the building had been irrevocably fixed by the architect's drawings, it was found to be in error by 4 minutes due to the inaccuracy of the axial lines given him.

Another case was that of a chemistry laboratory in planning which the architect was told vaguely that a railroad ran underground near by. When a survey was finally obtained the tunnel was found to come directly under the building. This led to considerable delay due to the necessity of obtaining complete information from the railroad company upon the character of the tunnel construction and to taking the necessary precautions against settlement of the new building.

An architect does not presume to be an engineer; and if he is forced to supererogate in this field, mistakes may be made. Below is a checking list of data the topographical map should provide, especially with a view to building operations. Obviously in certain localities some of the items would not apply.

Data a Topographical Map Should Give

a. The boundaries of the building-site, or the whole property as required, by means of courses and distances referred to the true or magnetic meridian. If the latter is used, this fact and the declination should be noted on the plan.

b. All dimensions to be U. S. Standard.

c. The lines and grades of streets and pavements.

d. The contours of the ground at one (1) foot intervals, also intermediate levels defining the surface at humps and saddles, along the banks of watercourses and gullies and at tops and bottoms of slopes.

e. Location, the orientation of walls and the dimensions of every existing structure on the building-site and the level of the first floor at main entrance of each. Whether dimensions are of basement wall or main wall above should be stated.

f. All trees having a diameter of six (6) inches or over, measured two (2) feet above the ground. The diameter and the species of each tree to be noted.

g. Outline of masses of smaller planting or shrubbery, if of permanent character. Outline of woods not affected by the proposed building operation.

h. All topographical features such as drives, walks, fences, etc., on the property not otherwise herein mentioned to be located and shown.

i. Elevation of the water surface of streams, springs, pools, etc. On large streams all possible information should be given concerning extremes of freshets.

j. Electric-current supply lines whether overhead (poles to be located) or underground (depth to be given).

k. Location, depth at bottom, size and material of water-mains.

l. Location, depth at bottom, size and material of sewers and other drains.

m. Location, depth at bottom, size and material of steam-supply lines. If tunnels, cross-section should be given.

n. Location, depth and size of gas-supply lines.

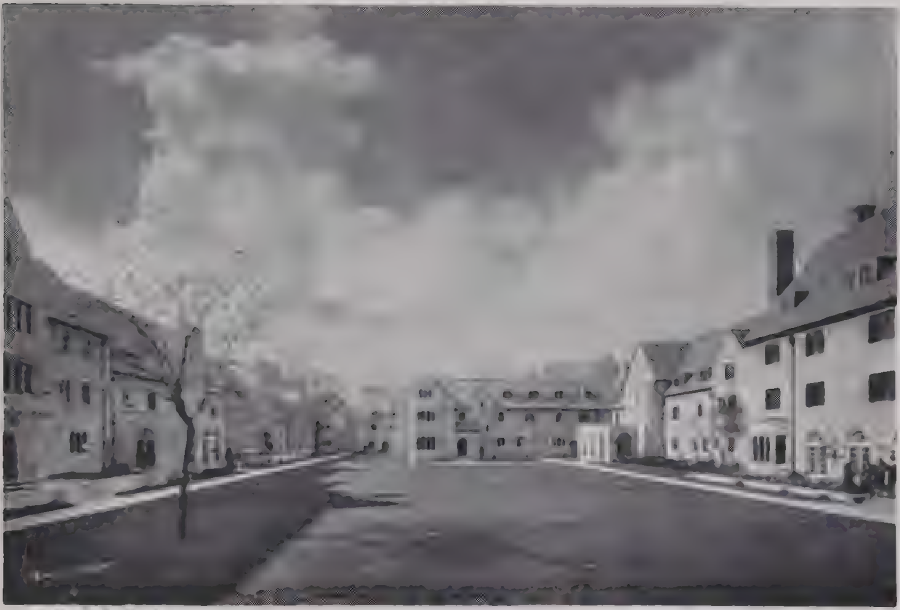
o. Similar data on any other supply lines such as compressed air or vacuum, telephone, telegraph, natural gas, etc.

p. Location and depths at summit and bottom of manholes and inlets of whatever kind.

q. Location of trolley-poles, lamp-posts, fire-plugs, letter-box standards, etc.

r. Kinds of electric current and water pressure supplied by the public mains.

After the first few conferences leading to a sketch plan fairly representative of what the building is to be, the services of a consulting mechanical engineer are needed to design the heating and ventilating and electric work, elevators, refrigerating and the like or what are known in some localities as the "mechanical" or "domestic" engineering trades. The organization of architects' offices is not usually upon such a scale as to include a person of the requisite experience and authority. It is, therefore, best for the owner and architect to



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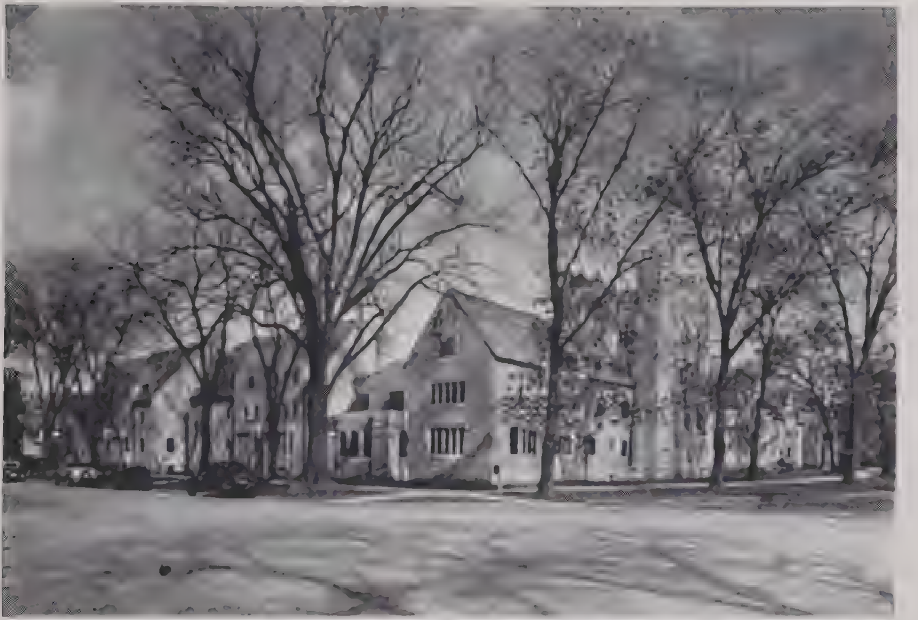

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GROUP OF SORORITY HOUSES, NORTHWESTERN UNIVERSITY.
JAMES GAMBLE ROGERS, ARCHITECT

concur in selecting an independent practitioner. His services may be within the scope of the architect's agreement with the college, the actual fee paid the engineer being reimbursed the architect, or he may be employed directly by the college. In any case he must work in harmony with and act as adjutant to the architect. Such engineers can only be found in the large cities where there is enough really professional work of this nature to afford them a livelihood, for the engineer must, like the architect, be upon a purely professional footing, with no interest in contracting or in manufacturing any of the products he specifies, in short, quite free from any commercial entanglements. It sometimes happens that the task of designing and preparing the specifications for heating and ventilating and electrical work is welcomed by the engineering department of the institution. In certain cases these departments are in a position so to function satisfactorily, but in far the majority of cases architects would prefer to have practising engineers co-operating with them.

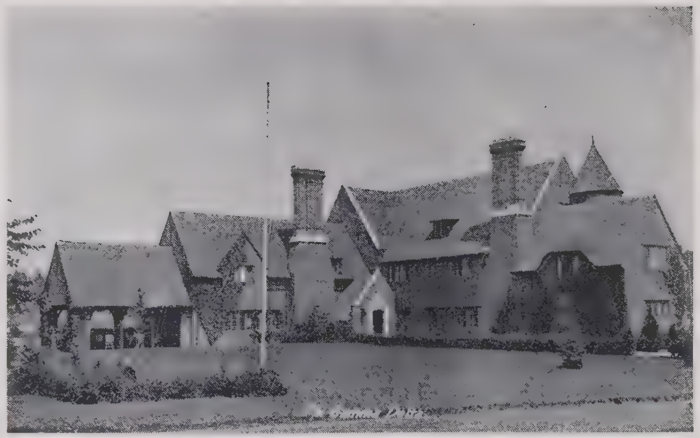
Other consultants will be the acoustical engineer whose work is usually rather limited and confined to one or several rooms. Another is the landscape architect whose work is manifestly the most general and not confined to any one building. At a large and active institution it is well that he be permanently engaged in like manner as the civil engineer.

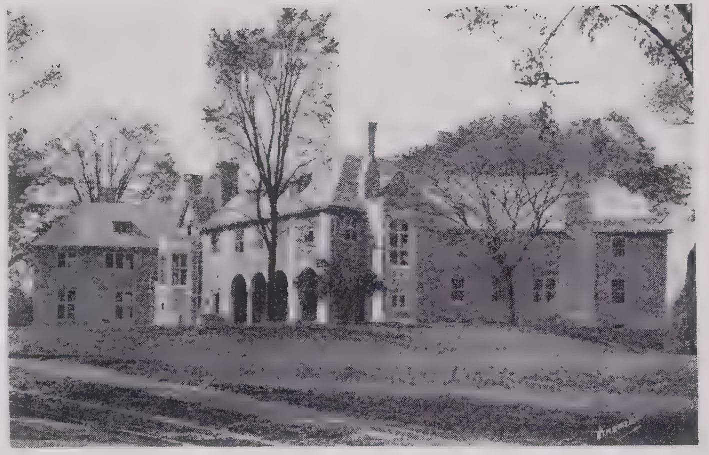
It is the task of the building committee to estimate the cost of a proposed structure, the amount necessary for its maintenance and the income expected from it,—for there will be an income if it is not a building for instruction only. The figures should be carefully weighed and a proper amount of money set aside as an endowment or reserve for keeping the building in repair. The construction budget should include, in addition to the probable cost of the building as the architect or the builder estimates it, all the appurtenant expense ultimately to be borne by the institution. This total may include preparing the site and completing the surroundings of the finished building by means of grading, walks, drives, sodding and other planting, the extension of service lines and drainage systems, equipment attached to the building (as in laboratories and gymnasiums), movable furniture (as in dormitories), in some cases the supplying of temporary heat and light to the building operation and water for building purposes, the salary of a clerk-of-works, bonding, fire and employers' liability insurance, professional fees, travelling expenses, etc. It is well to allow a contingency fund of about 5 per cent of the estimated cost of the building for unforeseen items of expense and desired minor additions during construction, and even more if the building is to satisfy the needs of a group of persons known for their caprice, indecision and love of luxury.

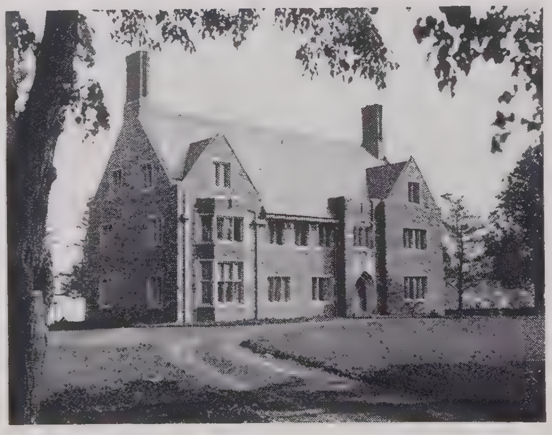
The drawings and specifications may be put out to the trade for competitive bidding or the work may be handed outright to a builder of advantageous position, proven capacity and known integrity. In either case a limit of cost should be an essential feature of the contract. Competitive bidding implies the selection of firms of equal scale and standing. It is well to select those having their home office within the geographical region in which the operation is situated. If any firm is invited to whom the committee would be unwilling to intrust the work, should it be the lowest bidder, embarrassment is likely to ensue. An irresponsible firm usually submits a low bid. If, however, such a firm is put on the list of bidders only as a relief from his persistent importuning, the moral obligation to award him the work largely disappears. The proper preparation of the contracts, obtaining performance bonds and other forms of insurance are left to the architect to conclude himself or to give directions for so doing.

There remains the building operation itself. This sometimes proves to be a veritable test of the administrative organization of a college. Here again, much depends upon the relationships of persons and the resting of authority. When as many as nineteen persons are counted (as in a recent case) charged with the oversight of a comparatively small operation the task of establishing co-ordination and harmony becomes apparent. A clerk-of-works paid by the owner should be present upon the operation during its entire course, that is to say, his daily hours should extend from the mortar-mixing by the laborers in the morning until the close of the working day. His superintendence is to be distinguished from the supervision of the architect and of the consulting engineers associated with him. These specialists inspect the work at frequent intervals and give directions when necessary. It is among the duties of the clerk-of-works to see that these directions are followed, for neither architect nor engineer is responsible for quality of workmanship. The businesslike management of extra and credit changes, the accurate appraisal of work done monthly and certifying to payment therefor are among the duties of the architect.

Sometimes an institution is tempted, with a view either to reducing cost of building or to keeping the personnel of a given arm of its organization occupied, to undertake the execution itself of a part of the building operation. This should be undertaken only after thorough and cautious consideration. It creates divided responsibility; it often proves impossible for the operations of the college department to interweave promptly and properly with those of the contractor, thereby





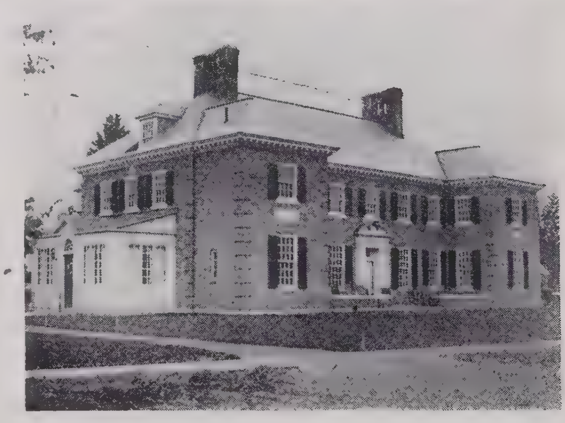


PHI GAMMA DELTA HOUSE (UPPER LEFT) AT PENNSYLVANIA STATE COLLEGE.
MELLOR, MEIGS & HOWE, ARCHITECTS

ALPHA CHI CHAPTER OF CHI PSI (UPPER RIGHT) AT AMHERST.
H. HERBERT WHEELER, ARCHITECT

SIGMA PHI PLACE AT HAMILTON (LEFT)
CLEMENT B. NEWKIRK, ARCHITECT

SIGMA NU HOUSE AT DARTMOUTH (RIGHT)
J. F. LARSON, ARCHITECT



causing claims for damage or delay, and in the end it usually effects a smaller saving than anticipated.

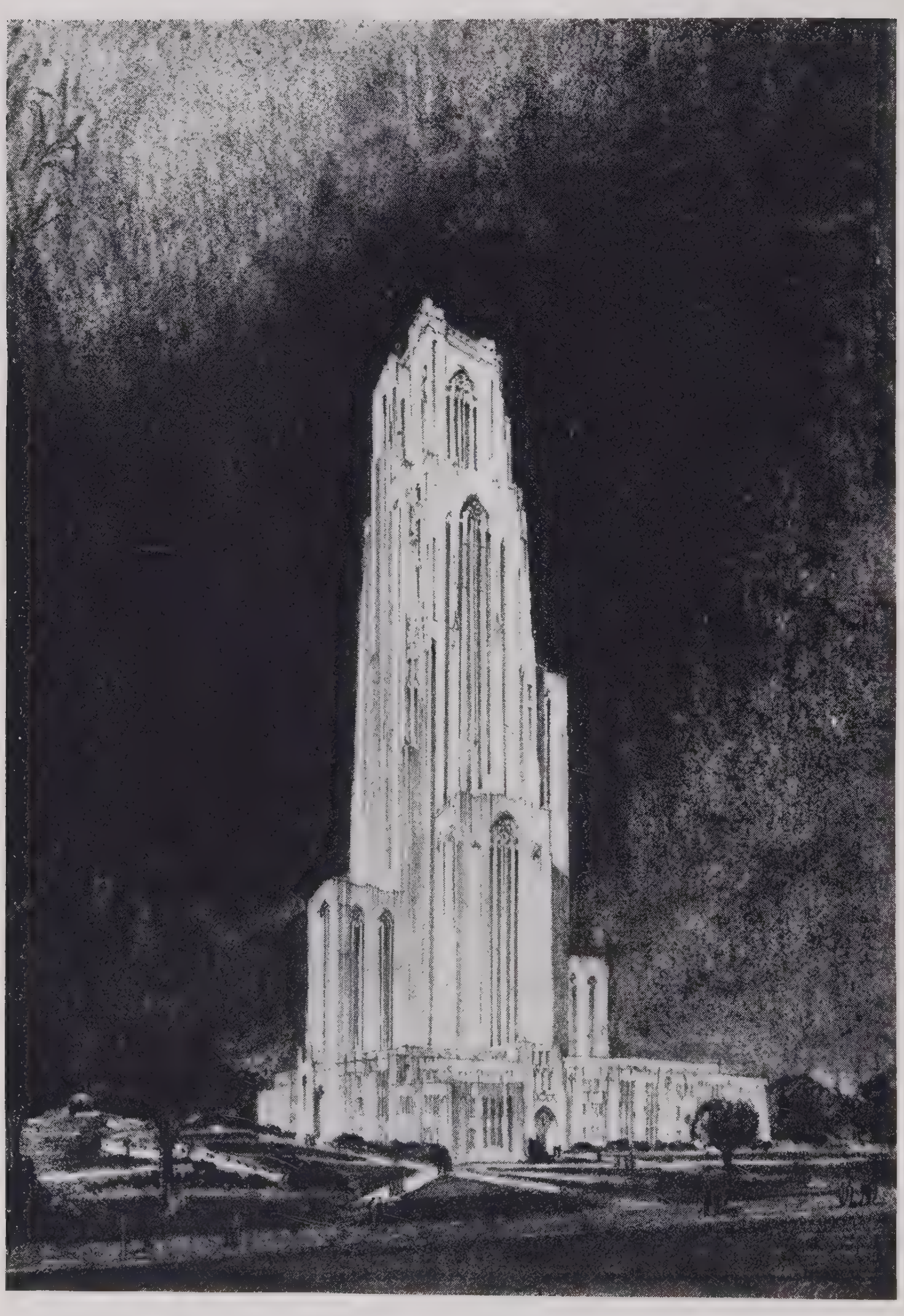
A few remarks may be made upon the subject of building costs, supplementing the observations made in earlier chapters. In the first place, the cost of a building means little unless it is known what the figure includes. A completely equipped and furnished building is so large an undertaking and involves so many components of cost that there is, notably in the region of its completion, a doubtful zone of what should logically be charged against the building. The books of the institution commonly give the cost of a building as including every possible item of expense that can be lodged against it. The builder, however, would place the cost of the completed building at a considerably smaller figure, *i. e.*, the dollars that have passed into his hands in payment for it. The architect names a somewhat higher figure, but he should always state whether the cost he quotes includes professional fees, lighting fixtures and equipment of the structure.

Similarly, the unit prices per cubic foot are useless for comparison, unless the same method of computing the cubage for each building is followed. For public schools a fairly accurate method of cubing has been established, but for other buildings of the kind architects design we have never found a generally accepted rule. For example, an architect bases such cost computation upon a completed college building which he has cubed at 754,000 feet; a professional quantity surveyor obtains 810,000 as the cubage from the same drawings. The only safe course appears to be to have the same person always do the figuring by the same method and then make the comparison.

The cost of dormitories is considered rather fully in Chapters VII and VIII. For other buildings our information shows the following range per cubic foot:

Administration and Academic Buildings	58 cents
Libraries and Museums	65 "
Chapels and Auditoriums	47 "
Science (Laboratory) Buildings	75 "
Engineering and Shop Buildings	45 "
Gymnasiums	32 "
Indoor Stadia	23 "

In giving these we are obliged to admit the vagueness and inaccuracies mentioned. The information was used as it reached us, for it was impossible to refer back to the source, thus annoying college officers by asking for an analysis. It appears that building costs average now about 100 per cent higher than before the war, and that they rise in



"THE CATHEDRAL OF LEARNING," UNDER CONSTRUCTION AT THE UNIVERSITY OF PITTSBURGH, FROM THE ARCHITECT'S DRAWING going from the Southern to the Middle Western and to the Eastern States. To obtain the necessary high standard of workmanship upon the most favorable terms, it is well to be guided by the following:

The use of local materials.

To obtain bids and erect as large a quantity of building as possible at one time. This applies especially to remote situations where the builder must establish an executive force which could direct three or four buildings as well as one.

To have competitive bidding always on a fair basis. Changes after the work is started preclude this, as does also permitting one builder to establish himself upon one building and then to invite bids on another. It is better to get bids on both at the same time.

Prompt monthly payments not only for work done but for 80 or 90 per cent of the value of materials delivered at the site.

Prompt decisions by the owner and architect, and prompt production of working detail drawings.

To specify several materials any one of which the builder can use at his option.

The same foundations will carry three or four stories as well as two and the same roof will cover them, but this commonplace should not be the excuse to build too high for architectural seemliness. Certain examples there are of high university buildings, to be sure, notably at Columbia and particularly in the lofty tower under erection at Pittsburgh. In the latter case there are numerous practical and economic advantages combining with the aspiring outlines of the design. The college and university world should be grateful to the University of Pittsburgh for venturing such a bold experiment, the outcome of which will be awaited with considerable interest.

The temptation to economize in quality of construction may easily be carried too far. Build well as far as you go is a good motto. Omit a wing if necessary and leave it for a future time. Omit finishing touches if necessary, and add them within a year or two after completion, but be sure to add them. Better build one story of wood than three stories that pretend to be fine and thorough, but fall so far short of it as to command the respect of no one.

A closing few hints: Don't fix *both* the size and cost of the building. Those who design it must have latitude in either one or the other. Allow sufficient time for thorough study in planning the building. Allow the builder sufficient time to erect it. Do not permit it to be occupied even partially before it is completed.

To build for these, our colleges and universities, should call forth the best efforts of every one concerned, that the completed fabrics may be permanent monuments of good craftsmanship and win for themselves increasing respect and affection as the years go by. Therefore, let them be reared in the fervent spirit that animated the ancient and worshipful guilds, with bricks and stones of honesty and truth and dedicated to perennial youth in its search for self-expression and for knowledge.

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